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An updated review on phyto-pharmacological and pharmacognostical profile of *Amaranthus tricolor*: A herb of nutraceutical potentials

Rajani Srivastava

Abstract
Amaranthus tricolor (Family-Amaranthaceae*)* purple red colour leafy vegetable consumed as nutraceutical herb in Bihar, Jharkhand and West Bengal. It has wide distribution in India as well as South Africa also used as pseudo-cereals in Europe and America. It is 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. *Amaranthus tricolor* known as lal saag in various parts of India, other popular names are Joseph's coat or red amaranth, Chinese Spinach, Garden Amaranth, Fountain Plant etc. Maarisha-rakta is the name used in ayurveda. Laal Shaak, Laal Marashaa are folk names of *Amaranthus tricolor.* This plant reported in ayurveda as astringent in menorrhagia, leucorrhoea, dysentery, diarrhoea, haemorrhagic colitis; also used in cough, bronchitis and externally used as emollient. It has been used for the treatment of piles, blood disorders, bladder distress, tooth ache, dysentery and as astringent, diuretic, haemorrhage and hepatoprotective action. The aim of present study is to provide updated information of *Amaranthus tricolor* through extensive literature survey of past 20 years regarding its pharmacognostical and phytopharmacological profile. The various literatures collected through E-journals of SHUATS for example CeRA, Scopus, Springer, Science direct and Google scholar.

Keywords: *Amaranthus tricolor, phtytochemical, pharmacological, lal saag*

1. Introduction
Amaranthus tricolor is very important purple red colour leafy vegetable, consumed in most parts of India mainly in Bihar, Jharkhand and West Bengal, also available in other tropical countries like South Africa. This plant is widely promoted African leafy vegetable. It belongs to a taxonomic group cultivated worldwide. 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 [1].

The number of Amaranthus species varies in literature. The genus Amaranthus L. consists about 65–80 and 455 species names, for the genus Amaranthus are known so far. Among all the species Amaranthus *tricolor* plant is popular not only for their nutraceuticals potentials but also for their colour and flavour. The rural people living in various part of India are still largely devoid of the modern healthcare due to their economic constraints. Exploring the lead from traditional knowledge and practices, the modern research is paying attention towards exploring plant sources for substances that provide nutritional as well as pharmacological advantages to humans. Usually carbohydrate rich foods are main source of energy but in India some of leafy vegetables are cheap source of proteins and vitamins. Among these leafy vegetables lal saag or Joseph's coat or red amaranth (*Amaranthus tricolor*) is consumed as staple diet in rural areas. Amaranthus plants or amaranths are defined as "never-fading flowers" in Greek. Several species of amaranths are often considered as weeds but in India it is consumed as spinach, the flavour of the raw or cooked amaranths is reported to be as equal to or better than the spinach or other leafy vegetables. It has been used for the treatment of piles, blood disorders, bladder distress, tooth ache, dysentery and as astringent, diuretic, haemorrhage and hepatoprotective agent [2].

Botanical description and Pharmacognostical profile

Whole plant of *Amaranthus tricolor*
Synonym: A. gangeticus Linn., *A. melancholicus* Linn., *A. polygamous* Linn. Hook. f. *A. tristis* Linn.
Family-Amaranthaceae.

Common vernacular names
Sanskrit: Marisarakta, aramasitalika
Bengla: Lal Shak
English: Chinese Spinach, Garden Amaranth, Fountain Plant.
Ayurvedic: Maarisha-rakta (red var.).
Siddha/Tamil: Arai-keerai, Siru-keerai, Thandu-keerai, Mulakkerai (Tamil).
Folk: Laal Shaak, Laal Marashaa
Guj: Tandaljo (Lal)
Hindi: Lal Marsa
Kannada: Dantu, Harave Soppu, Dantina Soppu, Chikkarive
Malayalam: Aramaseetalam
Marathi: Mash
Punjabi: Lal Marsa Sag
Tamil: Mulaikkeerai
Telugu: Erra Tatakura

Habitat and description about plant
It is an erect, diffuse, stout, annual herb, found throughout the India as cultivated or wildly grown herb. This plant reported in ayurveda as astringent in menorrhagia, leucorrhoea, dysentery, diarrhoea, and haemorrhagic colitis; also used in cough, bronchitis and externally as emollient. As per ayurvedic pharmacopoeia the plant contains amarantin, isoamarantin, betaine, amino acids, sterols, fatty oils, sitosterol, calcium and magnesium. The leaf juice, seeds, and root prescribed in ayurveda.

2.1 Macroscopic characteristic
Roots having Tap root, shape cylindrical, yellow in colour, with rootlets. Stem purplish pink cylindrical with longitudinal ridges and furrows, fracture, short. Leaf simple, 5-12 cm long, 2.5-7 cm wide, very variable in shape, rhomboid, ovate, lanceolate, obtuse apex, petiolate, membranous and purplish pink. Flowers clustered spike; bracteole, lanceolate, membranous with perianth, sepals 3, pinkish white, stamens three, anthers dorsifixed. Seed 1.5 mm in diameter, biconvex, smooth, shiny black coloured.

2.2 Microscopic characteristic
Root - Shows outermost layer of cork consist of 3-6 rows of thin-walled cells, a few outer layers exfoliating; secondary cortex consisting of 6-11 rows of tangentially elongated, tabular, thin-walled parenchymatous cells, a few of them containing micro sphenoidal crystals of calcium oxalate; secondary phloem arranged in continuous ring, consisting of thin walled cells, phloem parenchyma cells contain micro sphenoidal crystals of calcium oxalate; secondary xylem arranged in the form of a ring, below, centrally situated scattered vascular bundles present with xylem and phloem; these are larger, ground tissue consisting of thin-walled, parenchymatous cells, a few cells filled with micro sphenoidal crystals of calcium oxalate. Stem: Shows many thick-walled, oval to polygonal, collenchymatous cells present in the ridges, epidermis single layered with tabular cells under a thick cuticle; cortex differentiated into 3-9 layered, thick-walled, tangentially elongated, chlorenchyma cells having a few microsphenoidal crystals of calcium oxalate; vascular bundles collateral arranged in a concentric band consisting of phloem and xylem elements; inside the band, in the ground tissue a number of conjoint vascular bundles found scattered; ground tissue consisting of oval or round, thin-walled, parenchymatous cells, these cells are smaller toward periphery and larger towards centre, a few of these cells contain micro sphenoidal crystals of calcium oxalate. Leaf Petiole - Shows two notches which are lateral in position, epidermis single layer, followed by, 1 or 2 layers ventrally and 1 to 7 layers dorsally of collenchyma; rest of the cortex consisting of thin-walled parenchymatous cells, a few of them containing micro sphenoidal crystals of calcium oxalate; vascular bundles arc-shaped in three separate patches, elongated in the notches central one nearly circular, each consisting of xylem and phloem. Midrib - Shows single layered epidermis on both surfaces, followed by 1-2 layered collenchyma; rest of the cortex consisting of thin-walled, parenchymatous cells a few of them containing micro sphenoidal crystals of calcium oxalate; vascular bundles 4 in number in basal region and single in number towards apical region. Lamina: Shows single layered epidermis on both surfaces; upper epidermal cells, thin walled, oval to polygonal, with a few uni-to bicellular pointed epidermal hairs or trichomes, sinuous walls and a few stomata in surface view; lower epidermal cells composed of thin-walled cells oval to polygonal, having a number of rosette crystals of calcium oxalate and a few micro sphenoidal crystals of calcium oxalate; walls sinuous, stomata both anomocytic and anisocytic type; palisade parenchyma 2 or 3 layered; spongy parenchyma 3 or 4 layered consisting of circular, irregularly arranged cells.

2.3 Powder characteristic
Light green; shows lignified vessels with spiral thickening, rosette and micro sphenoidal crystals of calcium oxalate, fragments of irregular, sinuous, polyhedral, thin-walled, parenchymatous epidermal cells and palisade cells, anomocytic and anisocytic type of stomata [3].

3. Pharmacognostic study
The pharmacognostic evaluation including examinations of morphological and microscopic characters such as ash values, powder analysis, extractive values, moisture content and fluorescence analysis. Preliminary phytochemical screening was also carried out. Transverse section of the root showed the presence of cork cells, cortex, fibers, xylem and phloem. Total ash, acid insoluble ash, water soluble ash, ethanol soluble extractive and water soluble extractive were 12.8%, 6.89%, 5.0%, 7.6% and 20.0% w/w respectively. Phytochemical screening showed the presence of alkaloids, flavonoids, glycosides, tannins, proteins and amino acids. The study contributes to the development of standardization parameters of the plant which helps in the botanical identification of *Amaranthus tricolor* Linn [4].

4. Phyto-pharmacological profile

4.1 Antimicrobial and antioxidant activity

A. tricolor is reported to have significant antimicrobial and antioxidant activity due to the presence active constituents like polyphenolic conents and others. Petroleum-ether, chloroform, alcoholic and aqueous extracts of *Amaranthus tricolor* were screened for antimicrobial activity by cup plate method. The activity was compared with standard streptomycin and control (DMSO). Various organisms used in the study were gram +ve bacteria (*Bacillus subtilis* and *Staphylococcus aureus*) and gram -ve bacteria (*Klebsiella phuemoniae*, *Escherichia coli*, *Pseudomonas aeurginosa, Salmonella typhi*). The DPPH free radical scavenging activity was assessed.In this study, none of the extracts show a zone of inhibition. DPPH radical scavenging activity, reducing power, hydrogen peroxide scavenging activity and total antioxidant activity of leaves extracts of *A. tricolor* and vitamin C were presented. The water extract of *A. tricolor* leaves appeared to be as potent as vitamin C. Petroleum ether extracts having less inhibition than other extracts. The study revealed antioxidant potential of *Amaranthus tricolor* [5].

4.2 Antibacterial activity

The tannin content and antibacterial activity of *Amaranths tricolor* (L) leaf obtained from successive solvent extraction extracts, evaluated against few pathogens. The extracts were analyzed for presence of phytoconstituents, tannin content. The preliminary phytochemical analysis revealed the presence of steroids, alkaloids, glycosides, flavonoids and tannins. The extracts contained appreciable levels of tannin content. Antibacterial activity of *Amaranthus tricolor* (L) extracts were studied using agar well diffusion method which showed better activity against *E.coli* by methanolic extract antibiotic ciprofloxacin used as standard. In this study different extracts exhibited varying susceptibility pattern to the growth of the tested microorganisms. The results showed that methanolic extract exhibited prominent activity and ethyl acetate extract moderate activity followed by chloroform and petroleum ether extracts [6].

4.3 Phytochemical analysis and antibacterial efficacy

The antibacterial activity of *Amaranthus tricolor* evaluated in the leaf extract against clinical isolates of urinary tract infections. The leaf extract of *A. tricolor* was prepared by cold maceration using methanol. The preliminary phytochemical screening performed indicated the presence of carbohydrates, amino acids, proteins, steroids, alkaloids, glycosides, flavonoids and tannins. Clinical isolates of urinary tract pathogens such as *Staphylococcus saprophyticus, Enterococcus faecalis, Escherichia coli, Pseudomonas aeruginosa, Klebsiella pneumoniae* and *Proteus vulgaris* were used for the study. The antibacterial property was determined by agar well diffusion method and minimum inhibitory concentration (MIC) were determined for crude *A. tricolor* leaf methanolic extract by resazurin microtitre plate assay method. The results indicate that the methanolic leaf extract of *A. tricolor* has a notable antibacterial activity against tested microorganisms. The maximum antibacterial activity was observed against *E. coli*, a moderate activity was observed against *P. vulgaris* and minimum activity against *E. faecalis* with respect to that of zone diameter exhibited by the organisms. The minimum inhibitory concentration was ranged from 5.0 to 0.36 mg/ml. The *A. tricolor* leaf extract was found to contain some bioactive compounds with pronounced antibacterial activity [7].

4.4 Tumor cell proliferation and cyclooxygenase enzyme inhibitory compounds

Bioassay-directed isolation of leaves and stems of *A. tricolor* yielded three galactosyl diacylglycerols (1-3) with potent cyclooxygenase and human tumor cell growth inhibitory activities. The purified compounds were characterized by spectroscopic methods. In addition, the fatty acid moieties in diacyl galactosyl glyerols were characterized by GC-MS analyses. The galactosyl diacylglycerols 1-3 inhibited the cyclooxygenase-1 (COX-1) enzyme by 78, 63, and 93% and the cyclooxygenase-2 (COX-2) enzyme by 87, 74, and 95%, respectively. These compounds were tested for antiproliferative activity using human AGS (gastric), CNS (central nervous system; SF-268), HCT-116 (colon), NCI-H460 (lung), and MCF-7 (breast) cancer cell lines. Compound 1 inhibited the growth of AGS, SF-268, HCT-116, NCI-H460, and MCF-7 tumor cell lines with IC50 values of 49.1, 71.8, 42.8, 62.5, and 39.2 micro g/ mL, respectively. For AGS, HCT-116, and MCF-7 tumor cell lines, the IC50 values of compounds 2 and 3 were 74.3, 71.3, and 58.7 micro g/mL and 83.4, 73.1, and 85.4, respectively. This is the first report of the COX enzyme inhibitory activity for galactosyl glycerols and antiproliferative activities against human colon, breast, lung, stomach, and CNS tumor cell lines [8].

4.5 Anti-nociceptive and anti-inflammatory activity

The hydro-alcoholic extract of leaves of *Amaranthus tricolor* L. 100, 200 and 400 mg/kg body weight was studied for anti-nociceptive and anti-inflammatory activities in various animal models. Anti-nociceptive activity was carried out by using acetic acid-induced abdominal writhing test and hot plate test in mice. Anti-inflammatory activity was carried out by using carrageenan induced rat paw edema and cotton pellet induced granuloma tests in rats. The results showed significant anti-nociceptive activity and anti-inflammatory activity [9].

4.6 Antioxidant activity

Red Amaranth (*Amaranthus tricolor*) and green Amaranth (*Amaranthus viridis*) were analyzed for *in vitro* antioxidant profile before and after thermal processing in water at different temperatures and pH. Thermal processing was done at 60 ºC, 80 ºC and 100 ºC, whereas pH 5.0 and 9.0 were also used for extraction. The assays performed included DPPH radical decolourization assay, reducing power assay and assay for total phenolic contents. It was observed that the antioxidant activities and total phenolic content improved in case of the two vegetables after thermal processing and pH dependent extraction. Phenolic contents were nearly doubled after extraction at 100 ºC and at pH 9.0, separately, probably due to better solublization of the antioxidants in hot water and different acid-base conditions. Improvement in the total phenolic contents substantiated the free radical scavenging abilities of the two subject vegetables after aqueous extraction [10].

4.7 Hematological, Hypoglycemic, Hypolipidemic and Antioxidant Properties

In the present study the effect of *Amaranthus tricolor* leaf extract evaluated on some biochemical parameters in rats. *A. tricolor* aqueous extract was assayed for antioxidant properties using ferric reducing ability of plasma (FRAP) assay, 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay and phosphomolybdenum assay. The effect of the leaf extract on serum glucose and triglyceride, total cholesterol, low density

lipoprotein (LDL), very low density lipoprotein (VLDL), elevated high density lipoprotein (HDL), body weight and hematological parameters were assessed in diabetic and normal rats. Acute toxicity studies were also carried out. This study shows that the aqueous extract of *Amaranthus tricolor* possesses some beneficial antidiabetic properties [11].

4.8 Hepatoprotective activity against paracetamol (PCM) induced hepatotoxicity.

The present pharmacological investigation focuses on evaluation of the efficacy of aqueous extract of roots of *Amaranthus tricolor* Linn. for their protection against paracetamol (PCM) overdose induced hepatotoxicity. The biochemical investigation viz. serum glutamic oxaloacetate transaminase (SGOT), serum glutamic pyruvate transaminase (SGPT), alkaline phosphatase (ALP) and total Bilirubin (TB) was done against PCM-induced hepatotoxicity in wistar albino rats. The histopathological studies of liver were also done. The extract showed significant hepatoprotective effects as evidenced by decreased serum enzyme activities like SGPT, SGOT, ALP, and TB, which was supported by histopathological studies of liver. The aqueous extract showed significant hepatoprotective activity comparable with standard drug silymarin as well as hepatotoxin drug PCM [12].

4.9 Hepatoprotective CCl_4-induced liver toxicity

The ethanolic extract of *Amaranthus tricolor* L. leaves was tested for its efficacy against CCl_4-induced liver toxicity in rats. The hepatoprotective activity of *Amaranthus tricolor* was evaluated via measuring various liver toxicity parameters, the lipid profile, and a histopathological evaluation. A sleeping time determination study and an acute toxicity test were performed in mice. The results clearly showed that oral administration of *Amaranthus tricolor* for three weeks significantly reduced the elevated levels of serum GOT, GPT, GGT, ALP, bilirubin, cholesterol, LDL, VLDL, TG, and MDA induced by CCl_4. *Amaranthus tricolor* was also found to significantly increase the activities of NP-SH and TP in liver tissue. These biochemical findings have been supported by the evaluation of the liver histopathology in rats [13].

4.10 Antiviral/ribosome inactivating protein from *Amaranthus tricolor* leaves.

An antiviral protein (AVP), imparting high level of resistance against sunnhemp rosette virus (SRV) was purified from the dried leaves of *Amaranthus tricolor*. The purified protein exhibited approximately 98% inhibition of local lesion formation at a concentration range of approximately 30 μg/ml. The protein was found to be highly basic glycoprotein monomer, with neutral sugar content of 4%. The purified protein exhibited N-glycosidase and RNase activities, also isolated full-length cDNA clone, encoding this protein designated as *A. tricolor* antiviral protein-1. Two primers, one designed on the basis of N-terminal sequence of the purified protein and the other from the conserved active peptides of other AVPs/RIPs were used for PCR amplification of double stranded cDNA, isolated from the leaves of *A. tricolor*. The amplified fragment was used as a probe for library screening. The isolated full-length cDNA consisted of 1058 nucleotides with an open reading frame encoding a polypeptide of 297 amino acids. The deduced amino acid sequence of AAP-1 has a putative active domain conserved in other AVPs/RIPs and shows varying homology to the RIPs from other plant species [14].

4.11 Betalains

Betalain pigments are water-soluble red-violet (betacyanins) and yellow (betaxanthins) pigments. These pigments replace anthocyanins in most plant families of the order Caryophyllales. Betalain pigments are of particular interest because of their limited biological distribution, occurring only in those plant species confined to the order Caryophyllales, notably the red beet (Chenopodiaceae) and certain fungi such as the fly-agaric mushroom (*Amanita muscaria*). Betalains are now used for coloring food and because of their antioxidant and radical scavenging properties used against oxidative stress-related disorders, anticancer, antiviral and antiparasitosis agents. Betalains in *Amaranthus tricolor* leaf were identified by means of reversed phase high-performance liquid chromatography (HPLC) and Liquid chromatography-Mass spectrometry (LC-MS). Amaranthin was the major betacyanin pigment present in *Amaranthus tricolor*. In addition to the known compound red-violet amaranthin, two yellow pigments were detected in *Amaranthus tricolor*. A novel betaxanthin, methyl derivative of arginine betaxanthin was identified on the basis of UV-Vis spectra and mass spectrometric characteristics. The identified compounds were then evaluated for alpha-amylase inhibitory potential using Bernfeld method. Amaranthin and betaxanthin did not show alpha-amylase inhibitory activity. Betalamic acid displayed significant alpha-amylase inhibitory activity compared to that of a reference standard, acarbose [15].

4.12 Solvent extraction of *Amaranth betacyanins*

The present study based on assessing the effect of solvents on the yield and the color properties of amaranth extract. Two species of amaranth namely *Amaranthus gangeticus* and *Amaranthus blitum* were extracted with water, methanol and ethanol. Seven parameters like betacyanin content, total soluble solids, lightness, redness, yellowness, hue angle and chroma were analyzed to assess extraction efficiency. Correlation analysis was carried out to assess the linear association among the analytical variables. Principal component analysis was used to establish the relationships between the different analytical variables and to detect the most important factors of variability. Among the two varieties, *Amaranthus gangeticus* extract contained about two and half time more betacyanin with half of total soluble solids compared to *Amaranthus blitum.* Water is the best as solvent for extracting betacyanin from *Amaranthus gangeticus* and ethanol in case of *Amaranthus blitum* [16].

4.13 Flavonoids

In this study root, leaf, inflorescence and seed flavonoids of 7 *Amaranthus* L. taxa are compared in which *A. tricolor* also included. Aqueous-ethanolic extracts of collected plant material were examined to practice flavonoid detection, isolation and identification by 2-dimensional paper chromatography, thin layer chromatography, UV spectroscopy and available references. Results showed all of examined taxa have flavonoid sulphate, flavon *C & C-/O* glycosides and aglycons in their root and aerial parts with the exception of leaves that had not aglycons. Isorhamnetin, Kaempferol, Quercetin and Rutin were found in all of studied taxa aerial parts. All of taxa roots had kaempferol, quercetin and rutin. It is believed that plant color is directly or indirectly correlated with secondary metabolites specially flavonoids and anthocyanins. Based on these results it is concluded that the quantities and presence of important metabolites such as

flavonoids depend on the various parts of the plant used. In this study paper chromatography reported 6 flavonoids in *A. tricolor* [17].

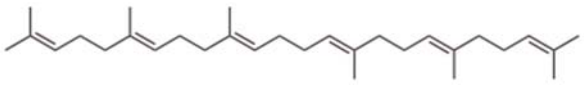
4.14 Heteropolysaccharide isolated

A water-soluble polysaccharide (PS-I), isolated from the aqueous extract of the stems of *Amaranthus tricolor* Linn. (*Amaranthus gangeticus* L.), was found to consist of L-arabinose, methyl-D-galacturonate, D-galactose, and 3-O-Ac-L-rhamnose in a molar ratio of nearly 1:1:1:1. On the basis of total acid hydrolysis, methylation analysis, periodate oxidation, and NMR studies (1H, 13C, TOCSY, DQF-COSY, NOESY, ROESY, HMQC, and HMBC). In this work, isolated two water-soluble polysaccharides (PS-I and PS-II). PS-I was found to contain arabinose, galactose, rhamnose, and methyl galacturonate but PS-II showed the presence of same sugars like PS-I with glucose as an extra moiety [18].

A C D B
→5)-α-L-Ara*f*-(1→4)-β-D-Gal*p*-(1→2)-3-*O*-Ac-β-L-Rha*p*-(1→4)-α-D-Gal*p*A6Me-(1→
Heteropolysaccharide

4.15 Squalene from amaranthus grain oil.

Grain amaranth has been suggested as an alternative to marine animals as a natural source of squalene. Oil contents, squalene contents, and fatty acid profiles were determined in 11 genotypes of four grain amaranth species. Although the oil contents of grain amaranth were low (from 5.1% in *Amaranthus tricolor* to 7.7% in *Amaranthus cruentus*) as compared to other oil-containing grains, high concentrations of squalene were found in total lipids, ranging from 3.6% in *Amaranthus hypochondriacus* to 6.1% in *A. tricolor*. The major fatty acids in Amaranthus oil consisted of palmitic acid (19.1-23.4%), oleic acid (18.7-38.9%), and linoleic acid (36.7-55.9%). A high degree of unsaturation was observed in Amaranthus oils, with S/U ratios of 0.26-0.32. A method to isolate and purify the squalene from Amaranthus oil was developed. After the saponification of K112, the squalene content increased from 4.2% in the crude oil to 43.3% in the unsaponifiables by the removal of the saponifiables. The unsaponifiables were fractionated by silica gel column chromatography to get highly purified squalene. The squalene purity in certain fractions was as high as 98%. Combining the fractions rich in squalene gave a 94% squalene concentrate, with a yield of 90%. The structure of squalene in the purified sample was confirmed by comparison of its ultraviolet spectrum with a standard and from its nuclear magnetic resonance spectra[19].



Squalene

4.16 Spray-dried betacyanin pigment

This study based on the drying behaviour of spray-dried betacyanin pigment powder extracted from *Amaranthus gangeticus* as influenced by spray drying conditions which include inlet temperature, feed concentration and feed flow rate. β- cyclodextrin and maltodextrin were used as encapsulating agents. Betalains from amaranth are used as natural food colourant for alcoholic beverages in northwestern Argentina and Bolivia, as well as for maize dough in southwest United States and Mexico [20].

5. Conclusion

Present paper provides updated information of *Amaranthus tricolor* through extensive literature survey of past 20 years regarding its pharmacognostical and phytopharmacological profile. *A. tricolor* consumed as cooked leaf vegetable or eaten as raw with salads, the soft stems also eaten and it is also used as an ornamental plant due to bright purplish red collared leaves and inflorescence. Amaranthin was the major betacyanin pigment present in *Amaranthus tricolor.* Two yellow pigments identified in *Amaranthus tricolor*, a novel betaxanthin, and methyl derivative of arginine betaxanthin. Its seeds are source of amaranthus grain oil which is reported to have high concentrations of squalene in total lipids and because of this fact it is suggested as an alternative to marine animals as a natural source of squalene. Betalains from amaranth are used as natural food colorants for alcoholic beverages. Isorhamnetin, Kaempferol, Quercetin and Rutin were reported to be found in most of the amaranthus taxa specialy in aerial parts. All of taxa roots had kaempferol, quercetin and rutin and chromatography reported 6 flavonoids in *A. tricolor.* A water-soluble heteropolysaccharide reported in, aqueous extract of the stems of *Amaranthus tricolor* which contain arabinose, galactose, rhamnose, and methyl galacturonate. An antiviral protein (AVP), providing resistance against sunnhemp rosette virus (SRV) was purified from leaves of *Amaranthus tricolor*. Tumor cell proliferation and cyclooxygenase enzyme inhibitory compounds were also isolated from this plant. Three compounds of galactosyl glycerols showed antiproliferative activities against human colon, breast, lung, stomach, and CNS tumor cell lines. *Amaranthus tricolor* showed maximum antibacterial activity against *E. coli*, a moderate activity against *P. vulgaris* and minimum activity against *E. Faecalis.*This plant reported to have wide spectrum of pharmacological activities: hepatoprotective, hematological, hypoglycemic, hypolipidemic, antioxidant activity, anti-nociceptive and anti-inflammatory. In conclusion *Amaranthus tricolor* herb have wide spectrum of pharmacological potentials and significant natural compounds that paves the ways towards advanced herbal drug discovery and herbal drug formulations.

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