



A REVIEW ON PHARMACOLOGICAL PROFILE OF AMARANTHUS CAUDATUS

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ABSTRACT

Purpose: An antiquated occasions have been utilized to treat a few infirmities Extracts of *Amaranthus*. *Amaranthus caudatus*, However. enthusiasm for ongoing decades has seen a resurgence. in vitro and in vivo examinations set up that *Amaranthus caudatus* of Literature synopsis. tributed significantly to solid cell reinforcement action has a few defensive and healing properties. portraying its phytochemical based Nutra-pharmaceutical properties and accentuates the clinical utility of the plant in different constant illnesses, This complete survey

basically investigates legends cases of *Amaranthus* with logical bits of proof, additionally characterizing hole territories for future clinical exploration. Information on 13 palatable *Amaranthuscaudatus*. an electronic inquiry including provincial logical diaries, propositions, books, and government reports. Information on 13 eatable *Amaranthus caudatus* was procured through. major bioactive fixings present in unrefined concentrates of explicit parts. These outcomes give a top to bottom examination of the component of the organic impacts of the activity of constituents disengaged from *Amaranthus caudatus* bioavailability and basic have not been turned out to be, subsequently requiring centered examination in this field.

KEY WORDS: *Amaranthus caudatus*, Antipyretic, Antioxidant and antimicrobial activities etc.

INTRODUCTION

Numerous Natural items have been our single generally important and fruitful wellsprings of drugs. Which is a fix to treat numerous medical issues in people? Each plant-like concoction production line equipped for incorporating a boundless number of exceptionally intricate and bizarre compound substances. Over half of the top rated pharmaceutical being used today are

gotten from normal items.^[1] Such natural prescriptions are effectively accessible less expensive, reliable and thought about more secure than some cutting edge engineered drugs. As of late WHO presented rule on examination and assessment of conventional meds and practice.^[2] Amaranth is a typical name for any blooming plants with blooms that don't promptly blur when picked. The vast majority of the *Amaranthus* are found in the tropics. *Amaranthus* are spices or bushes with basic leaves and blossoms in heads or spikes. The spikes are once in a while a few centimeters in length. *Amaranthus* have a place with the family *Amaranthaceae*.^[3] *Amaranthus* species is a verdant vegetable in the tropical district of world. It shapes a high level of the every day admission of verdant vegetables.^[4] A group of around 65 genera and 900 species. Around 18 genera and more than 50 species have been accounted for from India.^[5]

Amaranthus caudatus is developed for its leaves and is among the profoundly valued leaf vegetables in Nigeria because of their high dietary and business criticalness. There is an expanding consciousness of estimation of verdant vegetable in adding to adjusted eating routine, especially in territory where creature protein is lacking. Nitrogen was discovered to be the essential restricting variables of *amaranthus* creation.^[6] In the Indian arrangement of prescriptions various pieces of *Amaranthuscaudatus* are utilized as jaundice, amoebiasis, kidney infection, stomach torment, uncleanliness, fever, heaps, As blood purifier, Diuretic, Abortifacient, Vermifuge, Astringents and of liver sickness, antibacterial, hostile to tumor, and consume and wound-recuperating properties and brings down blood serum cholesterol and so forth. Because of *Amaranthuscaudatus* various utilizations and nearness of restoratively dynamic substance constituents permit as to compose this survey article and give therapeutic estimation of this plant to mainstream researchers.

PLANT PROFILE

Amaranthus caudatus Linn. belongins to the family *Amaranthaceae*. The Plant is also known as love-lies-bleeding plant.^[7]

Logical characterization/scientific categorization

Realm – Plantae

Division – Magnoliophyta

Class – Magnoliopsida

Request – Caryophyllales

Family – *Amaranthaceae*

Class – Amaranthus

Species – *Amaranthus caudatus*



Fig 1: Amaranthus caudatus.

Geographical Distribution

(*Amaranthus caudatus* L. Amaranthaceae) is accepted to be a local of North Central, South America, India, or Indo-Chinese area, Mexico and Mediterranean district. It is one of the few types of the Amaranthaceae family.

Description

It is a quickly developing plant with great leaf sizes, stem and blossoms. It effectively adjusts to various natural conditions and has a productive sort of photosynthesis which permits it to develop rapidly not needing a lot of support; this makes its development a lot simpler than different vegetables. Amaranth is a herbaceous yearly plant that can be developed under an assortment of conditions both sticky and bone-dry. It is handily developed from seeds. Numerous pieces of the plant including the leaves stem and seeds are palatable and are oftentimes utilized as food everywhere on over the world. Amaranthus shifted in shading relying upon the species from green, dull red, and so forth with smooth body surfaces (stem) with the exception of *A. spinosis* that have spine on the stem. The leaves are long or oval estimating between 5-10 cm or more. It tends to be developed on a wide scope of soils yet the best yield is reaped from ripe loamy soils high in natural issue or compost with great seepage

as the harvest is powerless to water logging. The yield is generally utilized as verdant vegetables and is a modest vegetable for the average person, which is exceptionally nutritious. An and C likewise, it additionally give protein, calcium, folic acid and phosphorus which are altogether basic supplements as expressed by nutritionists.^[8]

MORPHOLOGY

Root: Root morphology, development, improvement and dispersion in the dirt, just as its reactions to accessibility of supplements and water, have been scarcely explored in amaranths. 2.4 m length and 1.8 m expansive after just 10 weeks of development.^[9]

Stem: The stem measures from 0.5 to 3.5 m in tallness, is basic or expanded, contingent upon species, genotype and development conditions, yet chiefly on plant thickness.^[10]

Leaves: Leaves are of different shapes: elliptic, rhombic, applaud, lanceolate or rhombate-praise, with intense, insensitive or sharpen leaf tips, of green, red or silver shading. As a result of anthocyanin (amaranthine) colouration, totally red plants and plants with ruddy or silver spots on the leaves additionally exist.^[11]

Seed: The shade of the seed in amaranth fluctuates from white, gold, earthy colored and pink to black. Seed is lenticular and generally little that is 0.9 to 1.7 mm distance across.^[9]

CHEMICAL CONSTITUENTS

Different kinds of phytoconstituents, for example, Gallic acid, Caffeic acid, Rutin, Ferulic acid and Quercetin.^[12] *A. caudatus* contains antimicrobial peptides, agglutinin, triterpenoid, saponins and ironoliferin glycoside, protein, amino acids, nutrient E isomers, amaranthin and flavonoids.^[13]

TRADITIONAL AND MEDICINAL USES

Amaranthus caudatus is traditionally used in Jaundice, Amoebiasis and Kidney disease.^[14] In India *Amaranthus caudatus* was traditionally used to cure stomach pain, leprosy, fever, piles.^[15] As blood purifier, diuretic, abortifacient, vermifuge, astringents and of liver disease.^[16] Amaranth oil has antibacterial, anti-tumor, and burn and wound-healing properties. Amaranth oil also lowers blood serum cholesterol.^[17] The leaf has also been used as tea for relieving pulmonary conditions.^[18] This plant is used as anti-diarrheal.^[19]

LITERATURE REVIEW ON *AMARANTHUS CAUDATUS*

Evaluation of antidepressant activity

Discouragement is an incessant ailment that influences mental security, individual and social relations. A large portion of the home grown medications have tenants symptoms contrasted with manufactured meds. *Amaranthus caudatus* has a place with family *Amaranthaceae*. The present study was done to assess the energizer action of methanolic concentrate of entire plant of *Amaranthus caudatus* (MEAC) was examined by utilizing constrained swimming test (FST) and tail suspension test (TST) models. Creatures are separated into five gatherings, bunch 1 gets ordinary saline, bunch 2 and 3 gets escitalopram (4 mg/kg) and imipramine (4 mg/kg) and gathering 4 and 5 gets MEAC (100 and 200 mg/kg) portion individually. Primer phytochemical investigation demonstrated the nearness of phenolic mixes, steroids, alkaloids, flavonoids, saponins and amino acids in methanol concentrate of *A. caudatus*. It has been seen from our examination that both the *Amaranthus caudatus* separate at higher focus indicated critical ($p < 0.01$) decrease in idleness in tail suspension and constrained swim model which practically identical to escitalopram and imipramine. It is reasoned that *A. caudatus* have upper movement might be because of the nearness of polyphenolic mixes and flavonoids. Anyway further examination is expected to get component.^[20]

Anti-microbial activity

The current investigation was completed to assess the antimicrobial movement of *Amaranthus caudatus* linn, having a place with family *Amaranthaceae*. The stems and leaves of the *A. caudatus* was dried under ashade to a consistent load for about fourteen days. The dried material was then ground to a fine powder and the proteins removed with super cold extraction cushion (10mM NaH₂PO₄, 15mM Na₂HPO₄, 100mM KCL, 2m M EDTA, 1mM thiourea). A bit of the concentrate was added to 10ml of super cold extraction cradle in tubes and the cylinders set on a shaking stage for 2 hours after which they were centrifuged at 5000g for 10 minutes. So as to eliminate auxiliary metabolites and other non-protein particles that may contribute antimicrobial movement, the supernatants were stacked to a 5cm bed of Sephadex G-100 segment, equilibrated in 10mM sodium phosphate and eluted with 3.5 ml 10mM sodium phosphate. Elutes were gathered by volume of 1ml. The elutes were exposed to ninhydrin official to test for the nearness proteins on the vegetative pieces of *A. caudatus*. Antimicrobial proteins and peptides in plants have most generally been found in seeds, where they aggregate to significant levels and may likewise work as capacity proteins. Homologues of the seed proteins have been found in this manner at much lower focuses in vegetative and flower tissues. Antimicrobial movement was done against the test microorganisms.^[21]

Anti-atherosclerosis activity

An investigation was performed for the assessment of against atherosclerosis action of *Amaranthus caudatus* Linn. Coronary conduit infection (CAD), which is a multi-factorial malady regularly, causes dismalness and mortality in individuals. Researchers currently accept that there is a decent connection between the incendiary cycle and coronary atherosclerosis. An investigation was led to discover the counter atherosclerosis impact of *Amaranthus caudatus* L. on bunnies, and was contrasted and lovastatin. 25 male New Zealand bunnies were arbitrarily gathered into five and each were taken care of for 60 days with a standard eating routine, standard eating regimen and cholesterol, standard eating routine and *A. caudatus* remove (150 mg/kg every day), standard eating regimen and *A. caudatus* extricate (150 mg/kg day by day) with cholesterol, and standard eating routine with lovastatin (10 mg/kg) and cholesterol. At the 30th and 60th day of investigation, the biochemical elements were estimated and the greasy streak arrangement was assessed at the 60th day. Bunnies took care of with elevated cholesterol diet and *A. caudatus* separate altogether diminished the cholesterol, LDL-C, fatty substance, oxidized LDL (Ox-LDL), apo-lipoprotein B (apoB), CRP, atherogenic record (AI) and HDL-C and apo-lipoprotein An (apoA) expanded. Injury seriousness, in extricate beneficiary gathering, fundamentally diminished. *A. caudatus* separate diminished the most significant danger factors (the serum lipoproteins, apoB and Ox-LDL) of cardiovascular maladies and fiery variables forestalled atherosclerosis and was more powerful than lovastatin.^[22]

Pharmacological reactivity of isolated guinea pig ileum to ethanol leaf extract of *Amaranthus caudatus*

The pharmacological reactivity of guinea pig ileum to ethanol leaf concentrate of *Amaranthus caudatus* was resolved in vitro. Boundaries assessed incorporate the limit esteem and the focus proportion (CR). The power of the plant separates as communicated by EC₅₀, the E_{max} (most extreme reaction) and its relating fixation were resolved from the focus reaction bend in the nonappearance or nearness of 2X10⁻⁷ M atropine or 2X10⁻⁷ M mepyramine. The examination indicated that the concentrate of *Amaranthus caudatus* created a portion subordinate constriction of the smooth muscle of the guinea pig ileum with edge esteems at 80 or 100mg/ml individually. 2X10⁻⁷ M atropine or 2X10⁻⁷ M mepyramine separately caused a correct move on the total fixation reaction bend for each plant extricate. The potencies of the plant remove was fundamentally (p<0.05) diminished, and the fixation

creating Emax was altogether ($p < 0.05$) expanded within the sight of the foes. The ileal constriction created by *A. caudatus* was more touchy to mepyramine enmity. The EC50 (373.80 ± 51.56 mg/ml) and the fixation creating Emax (855.00 ± 75.00 mg/ml) for *A. caudatus* remove expanded fundamentally ($p < 0.05$) to 849.00 ± 29.16 mg/ml and 875.00 ± 25 separately within the sight of atropine, demonstrating that the concentrate communicated with muscarinic receptors. This investigation showed that *A. caudatus* prevalently animates muscarinic receptors to deliver compression of the gastrointestinal smooth muscle.^[23]

Anti-oxidant activity

The report was done that *Amaranthus caudatus* has a basic enemy of oxidant movement and it is a yearly spice and a well known vegetable. The counter oxidant property of the *Amaranthus caudatus* was broke down in vitro by DPPH decrease test and lessening power measure. In vitro enemy of oxidant examine was done DPPH decreasing test and lessening power test. For DPPH test methanol if extricate was utilized. For this 200 μ l of the concentrate was taken to which 1.8 ml methanol was included. To this 1ml DPPH arrangement was included. The blend was brooded in dim for 30 minutes at room temperature. The negative control contain 200 μ l methanol prepared similarly. The absorbance was taken in an UV spectrophotometer at 517 nm. From the decrease in absorbance for the example the radical rummaging action i.e RSA was determined utilizing the recipe condition.

% RSA = $[(A_0 - A_s) / A_0] \times 100$. The in vitro anti-oxidant exercises were discovered to be noteworthy by both the measure techniques.^[24]

Anthelmintic activity

In the current examination it was researched that *Amaranthus caudatus* Linn used to assess the powerful anthelmintic action. *Amaranthus caudatus* Linn, customarily utilized as vermifuge, so methanol concentrate of entire plant of *A. caudatus* was examined for anthelmintic movement utilizing worms (*Pheretima posthuma*). Different fixations (10-100 mg/ml) of methanol separate were tried in the bioassay. The night crawlers were partitioned into various gatherings, each gathering contains six worms. 50 ml details containing four unique centralizations of methanolic concentrate of entire plant of *A. caudatus* (10, 20, 50, 80 and 100 mg/ml in refined water) were set up in it. Season of loss of motion was noted when no development of any kind could be seen aside from when the worms were shaken vigourously. Season of death of worms were recorded subsequent to finding out that worms neither moved when shaken vigourously nor when plunged in warm water (50 °C). Piperazine

citrate (10mg/ml) was utilized as reference standard while water is utilized as control. The outcome gives logical approval to customary use.^[25]

Estimation of Barium Toxicity Mitigating Efficacy of *Amaranthus caudatus* Linn

This investigation was planned for evaluating the viability of *Amaranthus caudatus* Linn, the retention of barium. The seedlings of *Amaranthus caudatus* L. were treated with different centralization of barium (2mM, 4mM, 6mM, 8mM, 10mM) and its impact on the morphometric, biochemical and enzymatic characters were considered. Following ten days of treatment the development boundaries, for example, leaf territory, new weight, dry weight, shoot and root length were discovered diminished than in the control. Biochemical attributes, for example, the substance of chlorophyll, carotenoid, dissolvable sugar and protein likewise diminished with the expansion in the convergence of barium. In opposite, the free amino corrosive, proline, and leaf nitrate expanded and the exercises of catalysts, for example, catalase and peroxidase were likewise discovered to be expanded with the expansion in the convergence of barium while the action of nitrate reductase was discovered diminished. The outcome recommend that examination of the boundaries investigated between the treated and control uncovers that barium has truly influenced the *Amaranthus caudatus* L. and yet the plant embraces instruments, for example, collection of anthocyanin and upgraded exercises of cancer prevention agent catalysts to conquer the evil impacts of the metal particles. Consequently this examination is special as in, this plant *Amaranthus caudatus* L. having been discovered to be hyperaccumulative of metals can be Co-develop along side. Plants defenseless to metal poisonousness to conquer the issue of metal harmfulness to plant.^[26]

Comparative antipyretic activity of methanolic extracts of some species of *Amaranthus*:

The current point of this examination was researched to give logical approval to the antipyretic exercises of *Amaranthus viridis*, *Amaranthus caudatus* and *Amaranthus spinosus*. The antipyretic movement of methanolic leaves concentrates of every one of the three plants at portion of 200 and 400mg/kg was explored by yeast actuated pyrexia in rodents. Paracetamol (150mg/kg) was utilized as standard drug and control bunch got refined water. Rectal temperature of the apparent multitude of rodents were recorded and analyzed at 20 hr, preceding concentrate or vehicle or paracetamol organization, and again at 1 hr stretch up to 24 hr by the utilization of thermometer. At portion 400mg/kg all the three methanolic separates demonstrated critical ($P < 0.01$) decrease in yeast provoked raised temperature as contrasted and the standard medication paracetamol, where as 200mg/kg portion is less compelling

when contrasted and higher portion ($P < 0.05$). The outcomes indicated that the all plants have intense antipyretic movement.^[27]

Modulatory effect

The defensive impacts of *Amaranthus caudatus* and *A. hybridus* against sodium arsenite-incited harmfulness in rodents was assessed. *A. caudatus* has a more defensive impact on diminishing the micronuclei development when contrasted and *A. hybridus*. This examination proposes that *A. caudatus* and *A. hybridus* have anticarcinogenic impact.^[28]

Anti-cancer effect

Impact of cress (*Lepidium sativum*) seed (ling) exudates on seedling development in *Amaranthus caudatus* and *Lactuca sativa* was accounted for. The impact of the allelochemical(s) on organ morphology was forced essentially by guideline of cell extension, not cell division. It is inferred that cress seeds radiate endogenous substances, likely including lepidimoide, that basically manage cell extension in recipient plants.^[29]

Amino transferase activity

In vitro callus societies were set up from two plants that are normally wealthy in tocopherols *Amaranthus caudatus* and *Chenopodium quinoa*, so as to look at whether callus societies had the option to deliver these mixes at levels equivalent to those saw in planta. In *C. quinoa* societies, elicitation with MJ didn't have any impact, neither on tocopherol creation, nor on TAT movement. These outcomes are talked about corresponding to chloroplast separation and the interaction among jasmonates and phytohormones.^[30]

Effect of different levels of poultry manure on the performance of *amaranthus (amaranthus caudatus L.)* in bama, Nigeria

Field study was led in the dry period of 2013 (January – April) on the Teaching and Research ranch of College of Education, Science and Technology, Bama, Borno State, Nigeria, to examine the impact of various degrees of poultry compost on the presentation of *Amaranthus caudatus* (L). Information gathered were exposed to Analysis of Variance (ANOVA), huge methods were isolated utilizing Duncans Multiple Range Test. The utilization of 15 t/ha of poultry excrement was essentially ($P \leq 0.05$) better in all the boundaries estimated (mean plant stature, stem breadth, leaf width and length, leaves per plant, branches per plant and new collect per hectare). The most noteworthy leaf length (15.80 cm), leaves per plant (85.56), branches per plant (16.30), plant tallness (80.60 cm) and new weight of biomass gather

(21.70 t/ha) were gotten at 15 t/ha poultry fertilizer. It was trailed by 20 t/ha, 10 t/ha and 25 t/ha in diving request. While the most elevated portion of 30 t/ha was just fundamentally superior to the control treatment.^[31]

Nutraceutical value of kiwicha (*Amaranthus caudatus* L.)

Amaranthus caudatus L. (Amaranthaceae), regularly known as kiwicha, is considered as one of only a handful not many multipurpose pseudocereal crops which gracefully higher dietary seeds in immense amounts. *A. caudatus* is rich wellspring of proteins, β -carotene, nutrients, minerals, and dietary fiber. Amaranth starch is of promising use by its high solvency and absorbability, contrasted with wheat, rice, and oat, seeds of amaranths are without gluten and contain 30% more protein with complete arrangement of amino corrosive, offering additional opportunities for food handling, pharmacology, and beautifiers. Notwithstanding its dietary benefit, a few examinations have featured the significance of this *A. caudatus* as expected wellsprings of organically dynamic mixes with against diabetic, hostile to hyperlipidemic, and antihypercholesterolemic impacts and cancer prevention agent and antimicrobial exercises. In this way, the presentation in the eating routine of *A. caudatus* seeds could be related with wellbeing advancement and avoidance of infections.^[32]

Phytochemical Evaluation of *Amaranthus caudatus*.

Plant materials are rich of dynamic mixes which indicated huge restorative action. Portrayal of these phytocostituents of therapeutic plants is vital, because of its various advantages to science and society. Since the data acquired, makes pharmacological investigations conceivable. It likewise empowers structure related action studies to be completed, prompting the conceivable combination of more intense medications which decrease the harmfulness. The current exploration manages different physicochemical and phytochemical boundaries of *Amaranthus caudatus*, for example, flavonoids, diminishing sugar, phenol, nutrient C, lipid, complete starches and so forth quantitatively. Examination indicated the nearness of a lot of optional metabolites in this home grown plant which can be utilized as common medication.^[33]

Amino acid profile of *Amaranthus caudatus*

New leaves of *Amaranthus caudatus* were gathered and secured for amino corrosive profile with the sole point of considering the vitality of this leaves in food utilization in Adamawa State, Nigeria. The outcomes acquired from the investigation shows that seventeen amino acids were available in changing fixation in the vegetable. Glutamic corrosive, leucine,

aspartic corrosive and valine have extensive high fixation; 11.77 g/100g protein, 9.39 g/100g protein, 7.92 g/100g protein and 5.00 g/100g protein individually. Cysteine and methionine are the restricting basic amino acids in the vegetable with 0.93 g/100g protein and 1.09 g/100g protein individually. A large portion of the fundamental amino acids contrasted well and FAO/WHO principles.^[34]

Analysis of Antibacterial Activity of Biogenic Silver Nanoparticles Using Leaf Extracts of *Amaranthus caudatus*

Improvement of new antimicrobials for the administration of irresistible maladies turns into a matter of genuine concern. In this basic Situation, one of the most solid and promising elective helpful operators is silver nanoparticles (SNPs). Remembering the natural point of view, we combined silver nanoparticles in an eco-accommodating methodology, utilizing *Amaranthus caudatus* leaf remove as diminishing and balancing out specialist. The response cycle was basic and was checked by Ultraviolet-obvious spectroscopy (UV-vis). The green combined translucent silver nanoparticles were portrayed and affirmed by different diagnostic strategies, for example, Fieldemitter Scanning electron magnifying lens (FE-SEM) outfitted with EDAX (vitality dispersive X-beam), X-beam diffraction (XRD). Resultant metal nanoparticles demonstrated noteworthy antibacterial impacts against both Gram-positive and Gram-negative microorganisms which increments with increment of molecule portion. From the outcomes got it is recommended that biosynthesized NPs can address the clinical concerns and could be utilized viably sanitation applications likewise.^[35]

Study of Iron Bioavailability in a Native Nigerian Grain Amaranth Cereal for Young Children, Using a Rat Model"

Iron bioavailability in Nigerian grain amaranth oat braced by two individually. Body weight gain, hemoglobin increase, and centralizations of iron mixes, sodium ferric ethylenediaminetetraacetate (NaFeEDTA) phytate and tannin just as the protein proficiency proportion of braced and ferrous fumarate (FeC₄H₂O₄), was contrasted and that in oat amaranth oat were contrasted and similar boundaries from a past sustained with ferrous sulfate (FeSO₄). Grain amaranth is a significant investigation of iron bioavailability in strengthened Egyptian Balady bread arranged in view of its potential as an oat for small kids in Nigeria and with high-extraction wheat. Protein productivity proportion of strengthened amaranth other underdeveloped nations. Despite the fact that hemoglobin gain in each of the three gatherings oat was roughly 1.6 as contrasted and 0.9 for the Egyptian bread. taken care of

strengthened oat was essentially higher than that in the gathering took care of High relative natural qualities and expected body weight gain showed grain with no additional iron, hemoglobin gain was most elevated in creatures took care of ideal iron assimilation from the amaranth oat. This examination demonstrates amaranth grain with ferrous fumarate. Relative organic qualities for that ferrous fumarate is the iron fortifier of decision for grain amaranth creatures accepting unfortified amaranth oat or oat braced with oat. NaFeEDTA, ferrous fumarate, or FeSO₄ were 0.78, 0.93, 1.05, and 1.00.^[36]

CONCLUSION

From the above discussion, it can be concluded that the various Pharmacological activities has been reported for the different pharmacological actions. The literature proves that *Amaranthus caudatus* show effects like anti-oxidant, antimicrobial, antipyretic, antidepressant, anti atherosclerosis activity, and anticancer etc. Although the great majority of the research about the beneficial functions and actions of amaranth has been conducted in experimental animal models, there are compounds in the grain with potentially beneficial medicinal properties present in the various fractions. Future research should be directed to epidemiologic studies and towards consolidating the mechanisms of action, especially in the human body. Results of studies out-lined in this review provide an in-depth analysis of health effects of extracts from different bioparts and with reference to major bioactive ingredients of *Amaranthus caudatus*.

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