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Review

A Review of Phytochemical and Pharmacological Overview on *Celosia Cristata*

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Abstract

In traditional medicine, Celosia cristata (Family: Amaranthaceous) is frequently used to treat a variety of illnesses. Because the blossom resembles the head of a rooster (cock), Celosia cristata, a member of the genus Celosia, is frequently referred to as cockscomb. Numerous delicate components were separated from various plant sections. The plant exhibited a variety of pharmacological actions, according to current research. This review discussed Celosia cristata's pharmacological properties and chemical components.

Keywords: chemical constituent, cockscomb, and celosia cristata.

INTRODUCTION

Many secondary metabolites can be found in plants. Higher plants were the source of two thirds of the novel compounds discovered each year. 75% of people on the planet used plants for preventive and therapy. In the United States, where the pharmaceutical business is dominated by chemical synthesis, 25% of medications are derived from plants.

According to recent research, medicinal plants have a variety of pharmacological effects. Celosia cristata is the subject of the review. They are herbaceous, meaning they do not have a wood system, and are annual plants of tropical origin. They thrive in both humid and dry environments and their flowers can last for up to 8 weeks. A high number of seeds can be produced by each flower, up to 1,500 per gram or 43,000 per ounce. The plant often grows up to 30 cm (1 ft) in height, though many are smaller. The leaves are either green or bronze/maroon, depending upon the cultivar. The flower can be broken into three parts: their spikes, plumes and crests vary from one another but have standard commonalities they are usually brightly colored, usually red, yellow, pink, or orange, though other colours can be present. In some instances, a variety of colors are present in hybrids[2].

Nomenclature and classification

The Celosia species[3] is a small genus of edible and ornamental plants belonging to Amaranthaceous. The generic name is derived from the Greek word kelos, meaning "burned," and refers to the flame-like flower heads. *Celosia cristata* is a member of the genus *Celosia*, and is commonly known as cockscomb, since the flower looks like the head on a rooster (cock). It belongs to the class Magnoliopsida, order Caryophyllales and family Amaranthaceous.

Common name: Cockscomb, Crested celosia, Yellow toreador, Red cockscomb, Foxtail amaranth, Fire-flame bush, Shinaji tea and Woodfordia.

Scientific classification

Kingdom	**Plantae**
Order	Caryophyllales
Family	Amaranthaceous
Genus	*Celosia*
Species	*Cristata*
Binomialname	*CelosiacristataL.*

Description

This species is an annual herb, hairless entirely. The stem[4] is erect, thick, little branched, green or tinged with red, ridged, and flat near the upper part. The simple leaves are alternate, petiolate; the blade is long-elliptical to orally lanceolate, 5-13cmlong, 2-6cmwide, acuminate or attenuate at the apex, gradually narrow and recurrent at the base, and entire marginally. Occurring on top of the stem, the spikes are flat, succulent, crest-like or featherlike; down their middle are numerous flowers; the perinatal segments are light red to purplish red, yellowish white or yellow, elliptically ovate, pointed at the tip, 5 in number; the bract, bracelet and perinatal segment are carious; each flower has 5 stamens whose filaments are joined together to form a cup at the base. The fruit is an egg-shaped utricle, which is wrapped in the persistent perianth and becomes circumscissile when ripe. The seed is kidney-shaped, black, and lustrous.

Cultivation

The plants are hardy and can be grown easily from the seeds. Since the plants are of tropic origin, they thrive in areas with tropical climate. However, they can also be grown in summer months in the colder climate.

The plants[5]beingannualplants grow for only about one fourth of a year. A soil temperature of about 16 °C (60 °F) is ideal for growth. The plants arerelativelyeasy to grow and care for, having few insects that feed on them. Mites, though, are known to feed on the plants. The plants are also susceptible to leaf spotting, root rot and root strangulation.

However the former two can be prevented by avoiding a damp soil and the latter by frequent weeding. Also wetting the leaf and flowers should be avoided as they can lead to fungal diseases. It is common in Africa, South America, India and some parts of Asia.

Propagation of herb

Seed – so wearily to mid spring in award green house. Germination takes place within 2 weeks. When large enough to handle, prick the seedlings out into individual pots and plant them out after the last expected frosts. Consideration giving them some protection, such as a cloche, until they are growing away strongly

Traditional uses

Seeds were used as demulcent; for painful micturition and for dysentery. Flowers were edible in India, they were also used medicinally in menorrhagia and as an astringent which are used to treat bloody stool, hemorrhoid bleeding and diarrhea; the seed decoction is used to treat dysentery. The flowers[6, 7] were also used as astringent, styptic, depurative, uterine sedative, constipating, antibacterial, and corrective of urinary pigments, febrifuge and alexeteric. They were useful in the conditions of kapha and pitta, leprosy, burning sensation, skin diseases, diarrhea, dysentery, fever, headache, hemorrhoids, herpes, internal hemorrhage, leucorrhea, liver disorders, menorrhagia, ulcers, and wounds. Juice of leaves was used in bilious sickness. They were also valued as a stimulant in pregnancy. These ed was hypotensive and ophthalmic. It was used in the treatment of bloodshot eyes, blurring of vision, cataracts and hypertension. The flower and seed were astringent, hemostatic, parasitic ide and poultice. They were used in the treatment of bloody stool, hemorrhoid bleeding, uterine bleeding, leucorrhoea and diarrhea. The plant was also used for the treatment of fatigue, atherosclerosis, leucorrhoea and osteoporosis. Its seeds have been used for removing “liver-heat” improving eyesight, clearing wind- and as an anti-inflammatory agent.

Pats used: Fruit and seeds were used medicinally.

Physicochemical characteristics (w/w %)

Total cash value 5.54, acid insoluble ash1.14, water soluble ash2.78, sulphated ash0.8, moisture content 5.4, loss on drying 5.8, stomatal number 172 and stomatal index 25.

Chemical constituents [8-14]

The preliminary phytochemical analysis on the extracts of *Celosia cristata* showed the presence flavonoids, mucilage’s, phenolic compounds & tannins, sapiens, triterpenoids, alkaloids, carbohydrates, proteins, amino acids, gums and steroids. The plant contained beaning, and several sterols. The inflorescence contained amaranthine, isoamarantin, celosia in and isocelosianin. The seeds contain 10.1-12.8% of protein and yield 7.2-7.9% fatty oil. The plant also contained choline estersofhyaluronic acid. Six compounds were isolated from the ethanolic extract of *Celosia crostata*, and identified as 4-hydroxyphenethyl alcohol, kaempferol, quercetin, β-sit sterol, and 2-hydrox octadecanoic acid and stigma sterol. The analysis of *Celosia cristata* L.

Showed that the protein content in dried samples is about 19.40%, 24.60% and 27.04% in the inflorescence, leaf and stalk and seed respectively. These proteins are rich in all kinds of amino acid; many kinds of vitamins such as B1, B2, C, E and beta-carotene are in high content and dietary fiber and inorganic elements are abundant, the amount of fat in seed is about 10.1%. The total polyphenols, flavonoids and tannin contents of methanol extracts on the cockscomb flowers were 6.80, 2.34 and 6.23mg/g extract residue, respectively. Cochliophilin A (5-hydroxy- 6, 7-methylenedioxyfla- vine), known as a host-specific attractant towards the zoospores of *Aphanomyces cochlioides* was isolated from *Celosia cristata*, that is susceptible to the pathogen. Its content in Celosia seedlings was quantified as 1.4 μg/g fresh weight. A new is flavone, cristatein (5-hydroxy-6-hydroxymethyl -7, 2 0 -dimethoxyisoflavone, 2), and five known flavonoids were also identified. Five spooning, crispation, celosia a, celosia B, celosin C and celosin D were isolated from the seeds of *Celosia cristata*. A new triterpenoid spooning, semen side A, was isolated from Semen *Celosia cristatae*. Two glycoproteins, CCP-25 and CCP-27 were purified from the leaves of *Celosia cristata*. However, eighteen compounds were isolated and fifteen compounds were identified, they were p-hydroxyphenylethanol, kaempferol, quercetin, crispation, celosia A, celosia B, celosia, celosia, sphingosine, β-sit sterol, stearic acid, stigma sterol, daucosterol, palmitinic acid and n-hexacosoic acid.

Pharmacological effects Hemostatic effect [15]

Five days after mice were given decoction of Flos *Celosiae cristatae* with the dosage of 17g/kg, they were compared with a control group. It emerged that the bleeding time (BT) was shortened greatly (P0.01). Seven days after rabbits were given the same decoction with the dosageof1.7g/kg, it was found that the coagulation time (CT), prothrombin time (PT) and plasma recovery (PRT) were shortened (P0.05), and the globulin lysis time (ELT) was markedly shortened (P0.01) in comparison with control.

Hepatoprotectiveeffects[16]

A new triterpenoidsaponin, semeno side A was isolated from Semen *Celosia cristatae*. The hepatic protective activity of semen side A with an oral dose of 1.0, 2.0 and 4.0 mg/kg, respectively, were investigated by carbon tetrachloride (CCl4)-induced hepatotoxicity in mice. The results indicated that it had significant hepatoprotective effects ($p<0.01$). Cristatainsaponin exhibited significant the pato protective effect on carbon tetrachloride (CCl4)-and N,N- dimethyl form amide (DMF)-induced hepatotoxicity in mice, which were evidenced by significant decreases in the values of aspirate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP) of serum and histopathological examinations compared to controls. The antioxidant potential and protective effects of *Celosia cristata* L. (Family: Amaranthaceous) flower (CCF) extract sinter-butyl-hydro peroxide (t-BHP)-induced oxidative damage in the hepatocytes of Chang cells and rat livers was studied. Inviter, CCFex tract exhibited protective effect through their radical scavenging ability to enhance cell viability, prevent reactive oxygen species (ROS) generation, and inhibit mitochondrial membrane depolarization in t-BHP-induced hepatotoxicity in Chang cells. In vivo, oral feeding of CCF (100mg and 500mg/kg of body weight) to rats for five consecutive days before as in gledoseoft-BHP(2mmol/kg, i.p.) showeda significant ($p<0.05$) protective effect by lowering serum level so fglutamateoxaloacetate transaminase(GOT)andglutamatepyruvatetransaminase(GPT).Theextractdecreasedthe hepatic levels of lipid peroxidation (MDA) and serum level of triglyceride (TG) against t-BHP-inducedoxidativestress.Thehistopathologicalhepaticlesionsinducedbyadministrationof CCl4 were remarkably ameliorated by crispation. Furthermore, it appeared that lute Olin display hepatic protective property in CCl4 induced liver injury in mice.

Cytotoxiceffects[17]

The cytotoxicity of water and organic solvent extracts was determined in the fibroblast cellsCos7 and in four cancer cell lines: HeLa, HepG2, SK-Hep1 and LS 174T**.** The aqueous extracts were also screen ed against BVDV and HBV, whereas organic solvent text racts were assayed on *T. brucei***.** IC50 of the water extracts against Cos7, HeLa, HepG2, SK-Hep1 and LS 174T were 263.9,2773.5,200,180and >200 μg/mlrespectively.IC50 ofCH2Cl2 extracts against The La and Cos 7 were 472.0 and 136.0 μg/ml, while IC50 of MeOH extracts against the same cell lines, were 499.8 and 77.2 respectively.

Antioxidant effects[18]

The anti-oxidant and anti-aging activity of *Celosia cristata* were studied. *Celosia cristata* L. ethanol extract had anti-oxidant activity in a dose-dependent manner in 1-diphenyl-2-picryl- hydroxyl (DPPH) radical scavenging. Ethanol extract had anti-oxidant activity in a dose- dependentmanner.Silicadose-dependentlyincreasedtheintracellularROSgenerationinRAW 264.7 cells. *Celosia cristata* L. ethanol extract showed anti-aging effects, the hyaluronidase inhibitory effects and elastase activity inhibitory effects were relatively strong, which suggesting the *Celosia cristata* L. ethanol extract might be used as hydration and anti-wrinkle agents.

The antioxidant compounds and antioxidant activities of the methanol extracts and solvent fractions from cocks come flowers were studied. To determine the antioxidant compounds in the methanol extract and

solvent fractions, the total polyphenol, flavonoid and tannin were measured by spectrophotometric methods. These were evaluated for ant oxidative activities by DPPH and ABTS radical scavenging activities. The total polyphenol, flavonoids and tannin contents of methanol extracts on the cockscomb flowers were 6.80, 2.34 and 6.23mg/g extract residue, respectively. The DPPH and ABTS radical scavenging activities of the methanol extracts on the cocks come flowers were 52.43 and 107.01mg Trolox equivalent antioxidant capacity per g extract residue, respectively. The antioxidant activity test of *Celosia cristata* antiviral proteins (CCP-25 and CCP-27) using ferric reducing antioxidant power (FRAP) assay *in vitro* indicated that these proteins are strong antioxidants. The increase in activities of redox- enzymes such as peroxidase, catalase and polyphenol oxidase on tobacco mosaic virus (TMV) inoculation of test plants was inhibited when plants were treated with CCP-25 before TMV inoculation. The activity of phenylalanine ammonia lyase, involved in biosynthesis of ant oxidative compounds was also inhibited.

Adipogenic effect[19]

The in *vitro* the capacity of a *Celosia cristata* extract to impact the adipogenic potential of native human adipose tissue progenitor cells, *i.e.* commitment and differentiation towards adipogenic lineage, was evaluated. Native adipose tissue progenitor cells were isolated by immune selection/depletion approaches from human subcutaneous adipose tissues. Two distinct cell culture conditions were used to assess the effect of *Celosia cristata* extract on commitment and differentiation of progenitor cells. Cells were cultured either in differentiation medium for10 days in the presence/absence of *Celosia cristata* extracts to study the impact on differentiation or first cultured in a commitment-inducing medium, with or without *Celosia cristata* extract, for 48 h and then cultured 10 days in differentiation medium to assess the impact on commitment. In both experimental series, the fate of progenitor cells was studied by quantification of lipids and by determining the expression of key genes involved in abiogenesis. The Results showed that *Celosia cristata* extract reduces lipid content of progenitor cells undergoing differentiation. This reduction correlates with a reduced expression of C/EBP*α*. When progenitor cells are placed in commitment-inducing conditions, *Celosia cristata* extract induces a more potent reduction of lipid content. This reduction correlates with a decrease in the expression levels of master genes involved in abiogenesis: the genes of transcription factors PPAR*γ*2 and C/EBP*α* as well as marker genes coding for LPL and GPDH.

Antimicrobialandanthelmintic effects

The antimicrobial properties of ethanoic, methanol and other solvent extracts of *Celosia cristata* L. was evaluated against microorganisms, *Staphylococcus aureus, Bacillus subtillus, Salmonella typhimurium, Escherichia coli, Pseudomonas aeruginosa* and *Candida albicans*[20]. The minimal inhibitory concentration (MIC) values of the extracts against animal pathogenic bacteria and yeast were assessed using the brothmicrodilution methods. Results showed that the different extracts differed clearly in their antimicrobial activities. MIC values in the range 0.125 to 1mg/ml hexane fraction of methanol and ethanoic extracts exhibited good activity against *Staphylococcus aureus* (0.125 mg/ml), *Bacillus subtillus* (0.5mg/ml) and *Candida albicans* (1mg/ml) and dichloromethane fraction showed similar results. Preinoculation treatment with *Celosiacristata* leaf extract prevented lesion production by sunnhemprosette virus, tobacco mosaic virus and potato virus X in several local lesion hosts. The extract inhibited lesion formation only in treated areas, and did not act on the virus directly, but only *via* the host. The persistence of inhibitory activity in test hosts for up to 6 days indicates that the site of virus attachment is blocked semi permanently. Two N-terminally[21] blocked antiviral glycoproteins, CCP-25 and CCP-27 were purified from the leaves of *Celosia cristata*.

Study the anti-BVDV toxicity on EBTr cells, anti-BVDV protection in EBTr cells and anti-HBV effect in Hep G2, showed that the plant had no anti-BVDV toxicity on EBTr cells, anti-BVDV protection in EBTrcells, bulitadanti-HBV effectinHepG2inhigh concentration.

Antiviral protein named CCP-27 was purified from the leaves of *Celosia cristata* at the post-flowering stage by anion- exchange, cation-exchange, and gel-filtration chromatography. It exhibited resistance against sun hemp rosette virus in its test host Cyanosis tetragonoloba. It also exhibited deoxyribonucleic activity against supercoiled pBlueScript SK+ plasmid DNA. It was found to nick supercoiled DNA into nicked circular form at lower protein concentration followed by nicked to linear form conversion at higher protein concentration. CCP-27 also possesses strong ribonuclease activity against Torula yeast rRNA. Two antiviral glycoproteins, active against mechanical transmission of two tobamo viruses, tobacco mosaic virus and sun hemp rosette virus, and citrus ring spot virus (ungrouped), were purified from the dried leaves of *Celosia cristata*. These proteins, called CCP-25 and CCP-27, have M(r) 25 and 27 kDa. Their concentration was found to vary between the pre-flowering and post-flowering stages of *C. cristata* 90% lesion formation at a concentration of 20-30 µg ml(-1). They were resistant to proteases in the native state, but were readily digested when denatured. Both of them imparted actinomycin D sensitive resistance by inhibiting local lesions on Nicotine tabacum cv. Samsun NN by tobacco mosaic virus. Their application, individually, also resulted in high resistance in systemic hosts to sun hemp rosette virus, and citrus ring spot virus. Antiviral protein and antioxidant activity: Proteins CCP-25 and CCp-27 isolated from *Celosia cristata* leaves studied for correlation between its antiviral and antioxidant

activity. Antiviral proteins showed strong antioxidant activity through increase inactivitiesofredoxenzymes[22] such as peroxidase, catalase and polyphenol oxidase. It was evaluated using ferric reducing antioxidant power assay.

Antidiabeticeffect[23]

Celosia cristata L commonly known as cockscomb plant is widely used in folkloric medicine in the treatment and management of diabetes mellitus. The effect of methanol extract of Celosia cristata L. leaves on blood glucose level, superoxide dismutase (SOD), catalase (CAT), alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP) activities, and malondialdehyde (MDA) level were evaluated in diabetic rats. They were grouped as normal control, diabetic control, diabetic administered with 250 and 750 mg/kg b.w C. argenteus, and 5 mg/kg b.w glibenclamide. Diabetes was induced with alloxan monohydrate intraperitoneal at 120 mg/kg b.w. The control and diabetic groups were given distilled water and rat chow for 21 days.

Blood glucose level of each group was estimated every week, and at the end of the experiment, SOD, CAT, MDA and serum ALP, and AST and ALT activities were assayed in the liver and serum respectively of the experimental animals. The results showed a significant increase ($p<0.05$) in serum AST, ALP, and ALT activities and reduction in SOD and CAT activities compared with normal control groups. The extract at both doses significantly lowered the high levels of the serum enzymes and increased the level of CAT and SOD. These results indicate an anti-hyperglycemia and ant oxidative protective effect of C. argenteus leaves.

Other pharmacological effects

Celosia cristata was considered as one of the herbal therapy[24] acting as antitussive. Choline esters of hyaluronic acid from the plant, when fed to rats, showed antiulcer and gastro-protective effect. The plant prevented fluoride toxicity, the food supplemented with calcium can reduce the effect of high fluorine, and the food supplemented with both calcium and *Celosia cristata* extracts is better. The water extract of *Celosia cristata* could enhance immune function of mice. *Celosia cristata* could strengthen the mouse endurance and increase the deposit of muscle glycogen and hepatic glycogen[25].

CONCLUSION

The current studies focused that *Celosia cristata* possessed a wide range of therapeutic activities which were proved that this plant have a potential regenerator capacity of various cells, anti proliferative activity, antimicrobial potentiality, radiogenic potentiality, cytotoxic potential. The wide range of therapeutic potentialities of *Celosia cristata* are mainly due to the presence of various bioactive molecules in flowers, roots, stems, leaves and herbs. This review was innovating the further reconstructing the new biomolecules with potential pharmacological activity of Celosia cristata.

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