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Review Article

A COMPREHENSIVE REVIEW OF PHYTOCHEMICAL AND PHARMACOLOGICAL OVERVIEW ON *CELOSIA CRISTATA* FOR FUTURE PROSPECTIVE RESEARCH

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ABSTRACT

Celosia cristata (CC) is used in traditional medicine to cure several disorders. It is a member of the genus Celosia and is commonly known as cockscomb, since the flower looks like the head on a rooster. Many sensitive ingredients were isolated from different parts of the plant. The recent studies showed that the plant exerted a wide range of pharmacological activities. The chemical constituents and pharmacological activities of CC were presented in this review.

Keywords: *Celosia cristata*, cockscomb, chemical constituent.

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INTRODUCTION

Medicinal plants have a wide range of pharmacological effects. *Celosia cristata* (CC) is an annual plant [1-6] of tropical origin and lacking a woody stem. It grows well in both humid and arid conditions and their flowers can last for up to 8 weeks. A high number of seeds can be produced by each flower up to 1500 per g. The plant often grows up to 30 cm in height, though many are smaller. The leaves are either green or bronze/maroon, depending on 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 colors can be present in hybrids [7-9]. The novelty of current review is to know phytochemical and pharmacological overview of CC for future prospective research. By knowing its value it can be utilized for the future discovery.

NOMENCLATURE AND CLASSIFICATION

The *Celosia* species [6,8-20] is a small genus of edible and ornamental plants belonging to Amaranthacea. It belongs to kingdom Plantae, order Caryophyllales, family Amaranthaceae, genus *Celosia,* and species *Cristata*. The binomial name is *Celosia cristata* L.

Common name

It is commonly known as Cockscomb, Crested celosia, Yellow toreador, Red cockscomb, Foxtail amaranth, Fire-flame bush, Shinaji tea, and Woodfordia.

DESCRIPTION

CC is an annual herb, hairless entirely. The stem [21-28] 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 ovally lanceolate, 5–13 cm long, 2–6 cm wide, acuminate or attenuate at the apex, gradually narrow and decurrent at the base, and entire marginally. The spikes are flat, succulent, and crest-like. Numerous flowers are present in down middle. The perianthial segments are light red to purplish red, yellowish white, or yellow, elliptically ovate, pointed at the tip, 5 in number. The bract, bractlet, and perianthial segments are scarious. Each flower has five stamens whose filaments are joined together to form a cup at the base. The fruit has an egg-shaped utricle. The seed is kidney-shaped, black, and lustrous.

CULTIVATION

CC can grow of tropic origin. They can be grown in summer months in the colder climate. The plants [29-32] being annual plants grow for only about one-fourth of a year. The ideal temperature of soil is 16°C for growth.

PROPAGATION OF HERB

Seed sow early to mid-spring in a warm greenhouse. 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.

TRADITIONAL USES

Seeds were used as demulcent; for painful micturition and for dysentery. It is 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 [33-41] can be used as astringent, styptic, depurative, uterine sedative, constipating, antibacterial, and corrective of urinary pigments, febrifuge, and alexeteric. They can be used in the conditions of kapha and pitta, leprosy, burning sensation, skin diseases, diarrhea, dysentery, fever, headache, hemorrhoids, herpes, internal hemorrhage, leukorrhea, liver disorders, menorrhagia, ulcers, and wounds. Juice of leaves is beneficial for bilious sickness, a stimulant in pregnancy, blood shot eyes, blurring of vision, cataracts, and hypertension.

CHEMICAL CONSTITUENTS

The extracts of CC contain flavonoids, mucilages, phenolic compounds and tannins, saponins, triterpenoids, alkaloids, carbohydrates, proteins, amino acids, gums, and steroids [41-51]. The plant contained choline esters of hyaluronic acid, betanin, and several sterols. The inflorescence contained amarantin, isoamarantin, celosianin, and isocelosianin. The seeds contain 10.1–12.8% of protein and yield 7.2–7.9% fatty oil. Six compounds were isolated from the ethanolic extract of CC, and identified as 4-hydroxyphenethyl alcohol, kaempferol, quercetin, β-sitosterol, 2-hydrox octadecanoic acid, and stigmasterol [52-56]. Isoflavone, cristatein (5-hydroxy-6-hy-droxymethyl -7,2 0 -dimethoxyisoflavone, 2), and five known flavonoids were also identified. Five saponin, cristatain , celosin A , celosin B , celosin C, and celosin D were obtained from the seeds of CC. Triterpenoid saponin and semenoside A are isolated from semen of CC. Two glycoproteins, CCP-25 and CCP-27, were purified from the leaves

of CC. The compounds isolated from CC were p-hydroxyphenylethanol, kaempferol, quercetin, cristatain, celosin A, celosin B, celosin, celosin, sphingosine, β-sitosterol, stearic acid, stigmasterol, daucosterol, palmitinic acid, and n-hexacosanoic acid [57-62].

PHARMACOLOGICAL EFFECTS

Hemostatic effect

The mice were given decoction of Flos CC with the dosage of 17 g/kg after 5 days, and compared with a control group. It showed that the bleeding time was shortened. After 7 days rabbits were given the same decoction [63-66] with the dosage of 1.7g/kg. It was observed that the coagulation time, prothrombin time, and plasma recovery were shortened, and the euglobulin lysis time was markedly shortened in comparison with control.

Hepatoprotective effects

The hepatoprotective activity of semenoside A with an oral dose of 1.0, 2.0, and 4.0 mg/kg, respectively, was observed by CCl_4-induced hepatotoxicity in mice. The results showed that it had significant hepatoprotective effects. Cristatain saponin showed significant hepatoprotective effect on CCl4 and N, N-dimethylformamide-induced hepatotoxicity in mice, which were observed by significant decreases in the values of aspartate aminotransferase (AST), alanine aminotransferase (ALT), and alkaline phosphatase (ALP) of serum and histopathological examinations compared to controls [67-72].

Cytotoxic effects

The cytotoxicity [73-76] of water and organic solvent extracts was determined in the fibroblast cells Cos7 and in four cancer cell lines: HeLa, HepG2, SK-Hep1, and LS 174T**.** IC50 of the water extracts against cancer cell lines is compared.

Antioxidant effects

CC ethanol extract had antioxidant activity [77-80] in a dose-dependent manner in 1-diphenyl-2-picryl-hydrazyl (DPPH) radical scavenging. Ethanol extract had antioxidant activity in a dose-dependent manner. Silica dose-dependently increased the intracellular ROS generation in RAW 264.7 cells. CC ethanol extract showed anti-aging effects, the hyaluronidase inhibitory effects and elastase activity inhibitory effects were relatively strong which suggests the CC ethanol extract has hydration and anti-wrinkle property.

Adipogenic effect

The *in vitro* the capacity of a CC extracts to impact the adipogenic potential of native human adipose tissue progenitor cells. Native adipose tissue [81-84] progenitor cells were isolated by depletion approaches from human subcutaneous adipose tissues. Cell culture conditions were used to assess the effect of CC extract on commitment and differentiation of progenitor cells. Results showed that CC extract reduces lipid content of progenitor cells undergoing differentiation.

Antimicrobial and anthelmintic effects

The antimicrobial properties [85-88] of ethanolic, methanolic, and other solvent extracts of CC were evaluated against microorganisms, *Staphylococcus aureus*, *Bacillus subtilis*, *Salmonella typhimurium*, *Escherichia coli*, *Pseudomonas aeruginosa,* and *Candida albicans.* The minimal inhibitory concentration values of the extracts against animal pathogenic bacteria and yeast were assessed using the broth microdilution methods. Results obtained that the different extracts differed clearly in their antimicrobial activities.

Antidiabetic effect

The effect of the methanolic extract of CC leaves on blood glucose level, superoxide dismutase (SOD), catalase (CAT), ALT, AST, ALP activities, and malondialdehyde (MDA) level was examined in diabetic rats. The results obtained a significant increase in serum AST, ALP, and ALT activities and reduction in SOD and CAT activities compared with normal control groups.

Antinociceptive effect

Methanol extract of the whole plant of CC was used to evaluate the antinociceptive activity. The antinociceptive effect of CC was carried out in thermal (hot plate and tail immersion test) and chemical (acetic acid, formalin, and glutamate-induced nociception test) pain models in mice at various doses. Central and peripheral mechanisms are associated with CC showing significant antinociceptive effect [89,90].

Other pharmacological effects

CC was considered as one of the herbal therapy [91-97] acting as antitussive. Choline esters of hyaluronic acid from the plant, when fed to rats showed antiulcer and gastroprotective 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 CC extracts is better.

CONCLUSION

CC possessed a wide range of therapeutic activities which were proved that this plant have a potential regenerator capacity of various cells, antiproliferative activity, antimicrobial potentiality, adipogenic potentiality, and cytotoxic potential. The wide range of therapeutic potentialities of CC is mainly due to the presence of various bioactive molecules in flowers, roots, stems, leaves, and herbs.

AUTHORS' CONTRIBUTIONS

All authors have equally contributed for making this case report to be successful.

CONFLICTS OF INTEREST

None.

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