Review Article

Sarwālī(*Celosia cristata*): Medicinal importance in perspective of Unani medicine and pharmacological studies

ABSTRACT

Celosia cristata, commonly known as 'cockscomb,' is an annual erect herb belonging to the Amaranthaceae family. Locally referred to as 'Mawal,' it is cultivated in Kashmir gardens for ornamental purposes and can be found growing naturally in the plains and up to an altitude of 5,000 ft. in the Himalayas. In traditional Unani Medicine, the seeds and inflorescence of Celosia cristata are utilized for treating various health conditions, including sexual weakness, leucorrhoea, haemorrhoids, haematuria, diarrhea, urinary tract infections, wounds, diabetes, and dysuria. Celosia species, including Celosia cristata, contain a diverse array of phytoconstituents such as phytosterols, saponin, alkaloids, phenols, tannins, flavonoids, and steroids. Numerous pharmacological studies have been conducted on this plant, revealing its hemostatic, hepatoprotective, antioxidant, antidiabetic, anti-nociceptive, antiviral, and antimicrobial properties. This paper aims to shed light on the therapeutic applications of Celosia cristata based on both traditional Unani literature and scientific studies conducted on different parts of the plant.

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Keywords: Celosia cristata; Sarwālī; Cock's comb; Aphrodisiac; Unani Medicine.

1. INTRODUCTION

The vast diversity within the plant kingdom presents a rich source of novel compounds with notable medicinal properties. Among the approximately sixty species of Celosia, several stand out for their significance, including C. argentea, C. cristata, C. isertii, and C. spicata. Notably, these species are recognized for their incorporation into leafy vegetable diets.[2]Celosia exhibits two distinctive varieties of inflorescence: Celosia cristata and the Plume or plumosa type. The latter is characterized by fluffy, tiny flowers forming a feathery head. These flowers, predominantly red and yellow, distinguish the plumosa group within the Celosia genus. [3]The characteristic feature of the plumosa group within Celosia is the presence of fluffy, tiny flowers that collectively form a feathery head. These flowers are predominantly red and yellow in color, adding to the distinct and ornamental appearance of the plumosa variety. [4].

In Kashmir, Celosia cristata is locally known as 'Mawal' and holds a unique significance in the region. Notably, Mawal is the key ingredient responsible for imparting the rich color to Rogan josh, a traditional Kashmiri dish. The edible flowers of Kashmiri Mawal share visual similarities with spinach or basil in terms of both flowers and textures. Celosia cristata is

commonly referred to as 'cockscomb,' owing to the tightly clustered blooms that are said to resemble a rooster's comb. This annual dicotyledon herbaceous plant reaches a height of 1.5-2 feet and serves dual purposes as both an ornamental and medicinal plant. Belonging to the Amaranthaceae family, it goes by various names such as Lāl Murgha, cockscomb, and crested celosia. [3,5]Celosia cristata exhibits a widespread distribution, with a significant presence in Southern China and various tropical and sub-tropical regions across Africa, India, and Southern America. The plant is extensively cultivated as an ornamental species in several countries, including Malaysia, China, Japan, Myanmar, Mexico, the Philippines, and throughout India[7]. Its adaptability to different climates and regions makes it a versatile and commonly appreciated ornamental plant in diverse parts of the world.[7]In contrast, the flowers within the Cristata group of Celosia are densely clustered, creating a tight arrangement. Some observers have likened the velvety texture of these flowers to that of brain tissue. The flower heads within this group display a diverse range of colors, encompassing deep red, dark pink, and golden yellow hues. The unique texture and vibrant colors contribute to the distinctive and ornamental qualities of Celosia cristata within the Cristata group.[3,4]. Celosia cristata features an alternate leaf arrangement characterized by a simple sagittate shape, pinnate venation, and a length spanning from 2 to 4 inches. The leaves of this plant exhibit a variety of colors, including purple, red, or bright green.The flattened seed, known as semen cristata, is notably shiny and black. These seeds are tiny, kidney-shaped, with a thin and crumbly seed coat covering them. The distinct characteristics of both leaves and seeds contribute to the overall visual appeal and botanical traits of Celosia cristata [6].

Celosia cristata is rich in bioactive compounds, featuring Betanin and several sterols. The inflorescence of the plant contains specific compounds such as Amarantin, Isoamarantin, Celosianin, and Isocelosianin. The seeds are a source of proteins, oxalates, and yield a substantial amount of fatty oil, along with starch and an aleurone layer in the albuminous cell. The diverse array of phytoconstituents isolated from Celosia species includes phytosterols, saponin, alkaloids, phenols, tannins, flavonoids, and steroids. Numerous pharmacological studies have explored the therapeutic potential of Celosia cristata, revealing a range of effects such as hemostatic, hepatoprotective, antioxidant, antidiabetic, anti-nociceptive, antiviral, and antimicrobial properties.

This paper aims to emphasize the therapeutic applications of Celosia cristata, drawing from descriptions in Unani literature and scientific studies conducted on different parts of the plant. The presence of these diverse phytoconstituents underscores the plant's potential for various medicinal applications.

2. MATERIAL AND METHODS

A comprehensive literature review was conducted by searching all available classical textbooks using key terms such as Sarwālī, Taj Kharos, BustānAfroz, Kalghī-i-Kharos, and Lāl Murgha in the context of Unani medicine. Additionally, electronic databases including Google Scholar, ResearchGate, and PubMed were explored using keywords like Celosia cristata, Cockscomb, etc. The search included both classical Unani terms and botanical nomenclature. Review articles and experimental studies were carefully considered for data collection and subsequent analysis. This meticulous approach aimed to gather relevant information from both traditional Unani sources and contemporary scientific literature, providing a comprehensive overview of the therapeutic applications and properties associated with Celosia cristata in the context of Unani medicine.

3. Observations

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3.1 Geographical Distribution

Celosia cristata is distributed across Tropical Asia, Africa, America, and is widespread

throughout India. In the Indian subcontinent, the plant is cultivated as an ornamental species, both in the plains and at higher altitudes in the Himalayas, reaching up to 5000 feet. The adaptability of Celosia cristata to diverse geographical regions highlights its popularity and cultivation for ornamental purposes across a broad range of climates. [8,9] It is cultivated at many places in the Kashmir Valley.

3.2 Botanical description:

Celosia cristata is a medium to large-sized annual smooth herb characterized by a stout or slender stem (***Fig 1a***). The leaves are linear or lanceolate, stalked or sessile, and broad and oblong in shape. The flowers are small and come in varying shades of pink, red, or yellow, arranged in spikes that are often branched, with flattened united stalks. [10]The seeds of Celosia cristata are small, kidney-shaped, glossy, and black in color (***Fig. 1c***). They possess a thin, crumbly seed coat, and their diameter typically ranges from 1 to 1.5mm. [6,11] Additionally, the roots of the plant are white in color. [11,12]These botanical features collectively contribute to the distinctive characteristics of Celosia cristata.
Medium to large sized annual smooth herb. Stem stout or slender leaves linear or lanceolate, stalked or sessile, broad and oblong. Flowers small, pink, red or yellow, spikes often branched with flattened united stalks. [10] The seeds are small, kidney shaped, glossy and black in color, with a thin, crumbly seed coat covering them and they have a diameter of 1-1.5mm. Roots are white in color. [11,12]Flowering Period:July-September [13] Propagation:By seeds. [13]

Fig. 1 Showing ***a.*** fresh plant with flowers; ***b.*** dried flower and ***c.*** shiny black seeds. (Photos of the fresh plant and dried flowers are taken from Srinagar, Jammu Kashmir)

3.3 Taxonomical Classification [14]

Kingdom:	Plantae
Class:	Magnoliopsida
Order:	Caryophyllales
Family:	Amaranthaceae
Genus:	Celosia

Species: Cristata
Synonyms: *Celosia argentea* var *cristata*

3.4 Description in Unani Literature:

Traditional medicines are often preferred for their perceived safety and minimal harmful effects. The utilization of herbs as medicinal remedies has a rich history in countries like China and Japan. In India, Unani Medicine stands out as one of the most renowned traditional medicinal practices. Notably, a significant portion of the crude drugs employed in Unani medicine is derived from plant sources. [15,16] One such plant is Sarwālī, a 2-meter tall herb characterized by a broad stem resembling two fingers in width. Two varieties of Sarwālī exist, with one being taller than the other. It typically emerges in forests and around houses during the rainy season. The plant's branches are thin, delicate, and of a slippery greenish-red hue, originating from the root. The leaves, which can be either green or red-tanned, have terminal inflorescences approximately 1 inch long, exhibiting a velvety texture and appearing in whitish, red, or creamy yellow colors. Sarwālī's seeds, known as Tukhm-i-Sarwālī, are small, glossy, and black, primarily employed for medicinal purposes. The plant produces pleasant white and red flowers. Both the leaves and seeds possess a bitter taste. Interestingly, the leaves are edible and can be utilized in the preparation of food. This description highlights the multifaceted utility of Sarwālī in traditional medicine, not only for its medicinal properties but also for its potential as a source of nourishment. [11,15,16]

3.5 *Mutarādifāt* (Vernacular names)

The plant is known by various names according to different places and languages such as Cock’s comb and French marigold in English; Barṭānīqī in Arabic; BustānAfroz, Kalghī-i-Kharos, Tāj-i-Kharosin Persian; Borlas in Spanish; Chi Kuan in Chinese; In India it is known as Lāl Murgha in Bengali; Morashikha in Gujarati; Kokan, Lalmurghka, Morashikha in Hindi; Mowal in Kashmiri; Kai Kwan in Malayalam; Salarain Punjabi; MayurShikha in Sanskrit; Salaru in Sindhi; Kodijuttutotakura in Telugu and Sarwālī, Sirwālī in Urdu. [17,18,19,20,21]

3.6 *WajahTasmiya* (Nomenclature)

The name "Cock's comb" is derived from the resemblance of the Celosia cristata flower to the comb of a rooster. Similarly, the Kashmiri name "Mowal or Moaval" holds the same meaning, emphasizing the visual similarity to a rooster's comb. The genus name Celosia originates from the Greek word "Keleous," meaning burning, chosen because the flowers of the plant bear a striking resemblance to bright red flames. In Persian, the names Taj-i-Kharos and Kalghī-i-Kharos further underscore this floral resemblance, with "Taj" referring to a crown and "Kalghī" to a crest, both evoking the image of a rooster's distinctive features.

3.7 *Ajzā-i-Musta’mala* (Parts used)

Its seeds (*Tukhm-i-Sarwālī*) [15] and Inflorescence (flowers) are used medicinally.[13]

3.8 *Mizāj*(Temperament)

According to some physicians it is*MurakabulQuwwa*[17,22] and some says it cold and dry [23]

3.9 *MiqdārKhūrāk* (Dose)

The therapeutic dose is mentioned as: *Tukhm-i-Sarwālī* (Seeds) 4.5 g[15]; 3-5 g[23]; Sharbat(6 g)[17]

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3.10 *Af'āl* (Action)

It has *Muqawwi-i-Bah* (aphrodisiac), *Mudammil-i-Qurūh* (wound healing), *Muḥallil-i-Waram* (anti-inflammatory), *Dafi'-i-Ta'affun* (antiseptic), *Qābiḍ* (astringent), *Muṣaffi-i-Khūn* (Blood purifier), *Hābis al-Dam* (haemostatic) [15], *Mughlliz-i-Mani* (viscous semen)[23], *Dafi'-i-Ḥumma* (antipyretic)[17], *Muqawwi-i-Mi'da* (stomachic) actions. [22]

3.11 *Iste'mālāt* (therapeutic uses)

It is used for the treatment of *Qurūh* (wounds), *Suzāk* (gonorrhea), *Bakhr al-Fam* (halitosis), *Qulā'-i-Dahn* (Aphthous ulcer), *Kathrat-i-Ḥayḍ* (Menorrhagia), *Bawāsīr* (Haemorrhoids), *Kathrat-i-Bawl* (Polyuria), *Ātashak* (Syphilis), *Khurūj-i-Miq'ad* (Prolapse of rectum), *Dhayābīṭus* (diabetes), *Ishāl* (diarrhoea) Septic wounds, Pigmentation, Dysentery. [15,22,23]
A paste is applied to cure inflammations, and also applied to remove fever. Incinerated ash is used to stop menorrhagia. [17]

3.12 *Maḍarrat* (Toxicity, side effect and adverse effect)

It's important to note that, while the Celosia cristata (cockscomb) plant may have various traditional uses, including culinary and medicinal applications, excessive consumption or use may lead to adverse effects. Specifically, it has been reported that the plant can cause nausea, and prolonged or excessive use may result in harmful effects on the spleen. [15,22] As with any herbal remedy or traditional medicine, moderation and caution are crucial to avoid potential adverse reactions or toxicity. It is advisable to seek guidance from healthcare professionals or herbalists, especially when incorporating plants with potential medicinal properties into one's diet or healthcare regimen.

3.15 *Musleh* (Corrective):

It appears that in traditional practices, the potential side effects and toxicity associated with Celosia cristata, such as nausea and spleen-related issues, are addressed by using specific remedies. Unnāb, derived from Zizyphus sativa, is employed to counteract nausea. Additionally, Saunf sourced from Foeniculum vulgare (fennel), is used to mitigate potential toxic effects on the spleen. [15] It's important to note that traditional remedies may vary, and the effectiveness of specific herbs can depend on individual factors. While these traditional remedies may have been used in certain cultural contexts, consulting with healthcare professionals or herbalists is advisable for personalized advice and guidance, particularly if someone experiences adverse effects or toxicity from Celosia cristata or any other herb.

3.16 *Badal* (Substitute or Alternative):

In situations where Sarwālī (Celosia cristata) is not available, traditional substitutes are recommended. Tūdrī (*Lepidiumiperis*) and Chukandar (*Beta vulgaris*)[17,22,23] can be used as

alternatives. These substitutes may serve similar purposes or possess comparable medicinal properties in traditional practices. However, it is important to note that the efficacy and safety of substitutes may vary, and individuals should exercise caution and seek guidance from healthcare professionals or traditional practitioners when opting for alternatives.

3.17 Compound formulations

Several compound formulations such as *Habb-i-Munshit*, *Safūf-i-Behroza*, *Safūf-i-Jarayān* etc. are prepared, in which Sarwālī seed's has been used as one of the main ingredient, those compounds are mentioned in table with detail including the part used, dose and method of administration and indication.

Table 1: Unani compound formulations having *Celosia cristata* seeds as one of the main ingredient, mentioned with their dose, method of administration, and indications[25]

S.No	Unani compound formulations	Part used	Dose andMethod of use	Indications
1	*Habb-i-Munshit*	Seeds	1 Tablet BBF with milk	It has *Mumsik-i-Mani* (Retentive of semen) property.
2	*Habb-i-Rija*	Seeds	1 pill	It is useful in *Maraḍ-i-Rijā'* (Pseudo pregnancy/Mole).
3	*Safūf-i-Behroza*	Seeds	6 g with milk (250 ml)	It is useful in *Suzāk* (gonorrhea)
4	*Safūf-i-Darchiniwala*	Seeds	12 g BD with milk	It has *Muqawwi-i-Bāh* (aphrodisiac), *Mughlidh-i-Manī*(viscous semen) properties and used to cure *Sur'at-i-Inzāl* (premature ejaculation), *Saylān al-Raḥim*(leucorrhoea) etc.
5	*Safūf-i-Jarayān*	Seeds	7 g with milk	It is useful in *MuzminJarayān-i-Manī* (Chronic spermatorrhoea).
7	*Safūf-i-Mughlidh-i-Manī*	Seeds	7 g with milk or water	It is useful in *Jarayān-i-Manī* (spermatorrhoea), *Sur'at-i-Inzāl* (premature ejaculation).
8	*Safūflmsāk-i-Manī*	Seeds	12 g in the morning with milk and 9 g at night with cold water	*Jarayān-i-Manī* (spermatorrhoea)

3.18 Uses in Kashmiri Tradition

The Kashmiri cockscomb flower, locally known as "Mawal," (***Fig 1b***) is distinctive for its vivid red color and holds a unique culinary significance. This flower is not only used as a spice but also plays a crucial role in enhancing the visual appeal of delicious dishes. In Kashmir, locals utilize both fresh and sun-dried Mawal flowers, boiling them to create a red food coloring. This natural coloring agent becomes a key ingredient in renowned WAZWAN dishes like

Comment [I4]: It is also necessary to explain the dosage and use for flowers

Comment [I5]: Are those dry seeds or fresh seeds?

Comment [I6]: How many grams is the dose of 1 BDF tablet?

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Rista, Lahabi Kabab, Mirchī Korma, and others, contributing both flavor and vibrant color to these culinary delights.[24]

3.19 Phytoconstituents

The plant Celosia cristata contains various bioactive compounds and nutritional components. Some key constituents found in different parts of the plant (**Table 2**):

Table 2 Showing parts of the plant, their chemical constituent

Plant parts	**Chemical constituents**	
Whole plant	Betanin [26]	A nitrogen-containing anthocyanin responsible for the red color in the plant.
	Sterols [12,13]	Including major compounds like 24-ethyl-22-dehydrolathosterol and 24-ethyllathosterol.
Inflorescence	Amaranti, Isoamarantin, celosianin, and Isocelosianin[12,13]	These are compounds found in the inflorescence.
Seeds	Oil [12,13]	The seeds yield oil with various fatty acids, including lauric, myristic, palmitic, stearic, oleic, linoleic, and linolenic acids.
	Alkaloid [12,13]	Presence of an alkaloid has been reported.
Roots (Aqueous extract)	Fatty acids[12,13]	The aqueous extract contains several fatty acids, particularly hexadecadienoic acid and tricosanoic acid. Presence of 1,1-[3-(2-cyclopentylethylidene)-1, 5-pentanediyl]-bis-cyclopentane and alpha-aminobutyric acid
Dried sample	Dried samples of Celosia cristata contain all types of amino acids, indicating a rich protein profile; dietary fibers; vitamins Including B1, B2, C, E, and beta-carotene [24]	

3.20 Pharmacological studies:

3.20.1 Hemostatic effects

The mice received a decoction of Flowers of *Celosia cristata* after five days at a dosage of 17g/kg, and their results were compared to those of a control group. It demonstrated a reduction in the bleeding time. The same decoction was administered to rabbits at a dose of 1.7g/kg after 7 days. In comparison with the control, it was noted that the coagulation time, prothrombin time, plasma recovery, and euglobulin lysis time were all significantly shorter.[27]

3.20.2 Hepatoprotective effect

Cristatain isolated from ethanolic extract of seeds of Celosia cristata was investigated for hepatoprotective activity. Hepatotoxicity was induced by using chemical factors as CCL4 and DMF. Oral administration of Cristatain inhibited CCl4 and DMF-induced elevation of serum transaminase activities in a dose dependent manner, showing hepatoprotective activity and it was also confirmed by histopathological hepatic lesions. [28]

3.20.3 Antioxidant effects

The ethanol extract of *Celosia cristata* flowers demonstrated dose-dependent antioxidant activity in the scavenging of 1-diphenyl-2-picrylhydroxyl (DPPH) radicals. The antioxidant activity of ethanol extract was dose-dependent. In RAW 264.7 cells, silica dose-dependently elevated the production of intracellular ROS. The anti-aging properties of *Celosia cristata* ethanol extract also exhibited relatively strong hyaluronidase and elastase activity inhibitory effects, indicating that it possess hydration and anti-wrinkle properties. [29]

3.20.4 Antinociceptive effects

The antinociceptive activity was assessed using a methanol extract of the entire *Celosiacristata* plant. In thermal (hot plate and tail immersion test) and chemical (acetic acid, formalin, and glutamate-induced nociception test) pain models in mice, the antinociceptive effect of *Celosia cristata* was tested at different doses. *Celosia cristata* exhibits a strong antinociceptive effect through both central and peripheral mechanisms. [30,]

3.20.5 Anti-diabetic effects

Male albino rats were used as the diabetic control, normal control, and diabetic induced with 250 and 750 mg/kg BW, *C. cristata* leaf extract and diabetic with 5 mg/kg BW glibenclamide in order to assess the anti-diabetic action of *Celosia argentia var. cristata* L. methanolic extract. Following a 21-day observation period, the sample's concentration was observed to have significantly decreased to 103.33plus minus 17.47, 85.00 plus minus 5.19mg/dl for 250, 750 mg/dl BW of Celosia extract, and 104.33 plus minus 10.40 mg/dl for glibenclamide. [31]

3.20.6 Antimicrobial effect

The antimicrobial properties of *Celosia cristata* seed extracts in ethanolic, methanolic, and other solvents were assessed in relation to microorganisms, including *Bacillus subtilis*, *Staphylococcus aureus*, *Salmonella typhimurium*, *Escherchia coli*, *Pseudomonas aeruginosa*, and *Candida albicans*. The broth microdilution methods were used to determine the extracts minimal inhibitory concentration values against yeast and animal pathogenic bacteria. Findings showed that there were clear differences between the various extracts in antimicrobial activities. [32]

3.20.7 Adipogenic effects

The *Celosia cristata* seedling extracts have ability to influence native human adipose tissue progenitor cells and have capacity to become adipogenic. Progenitor cells of native adipose tissue were extracted from human subcutaneous adipose tissues using depletion techniques. The impact of the Celosia cristata extract on progenitor cell commitment and differentiation was evaluated under cell culture conditions. The lipid content of progenitor cells undergoing differentiation is reduced, according to the results, by the extract of *Celosia cristata*. [32]

4. CONCLUSION

According to Unani Medicine *Celosia cristata* has mentioned to possess a wide range of therapeutic activities. On the basis of various researches, it is proved that this plant has a high potential as a healing agent, potential regenerator capacity of various cells, antiproliferative activity, antimicrobial potentiality, adipogenic potentiality, and cytotoxic activities. These therapeutic potentialities are attributed to the presence of various bioactive molecules found in different parts of the plant, including flowers, roots, stems, leaves, and

the whole herb. While compound formulations using Celosia cristata are utilized in treating diseases of the male reproductive system in Unani Medicine, it is noted that there is a need for more comprehensive studies. Further research is recommended to explore the hidden properties of the plant and its compounds, providing a deeper understanding of its therapeutic capabilities and potential applications in various health conditions.

CONSENT (WHEREEVER APPLICABLE)

Not applicable

ETHICAL APPROVAL (WHEREEVER APPLICABLE)

Not applicable

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