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Celosia Argentea: A review of its Pharmacognosy, Phytochemistry & Pharmacological activities in managing urolithiasis and various diseases.

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Abstract :

This review article examines Celosia argentea L., commonly called "Quail Grass" or " silver cock's comb" taking look on its medicinal and historical usage in various cultures. It analyses that the plant's phytochemistry, pharmacognosy and its chemical composition, with a special focus on its potential to treat kidney stones (anti-urolithiatic activity), along with its other therapeutic activities such as antidiabetic, antimicrobial, antimitotic and wound healing activity. The article suggests that Celosia argentea will be beneficial in modern medicine so it should needs more research in this medicinal field. This herb is a valuable source for scientists, researchers, healthcare practitioners, and enthusiasts of herbal remedies.

Keywords: *celosia argentea L., phytochemistry, pharmacognosy, anti-urolithiatic, herbal remedy.*

Introduction :

Celosia argentea, also known as silver cock's comb or plumed cockscomb.[1] Its leaves and flowers are used as vegetables in India. It Is an annual herb that belongs to the family Amaranthaceae.[2] *This herb is gaining attention for its possible ability to treat urinary stones. These stones are excruciating and affect many people worldwide. Recently, there is been a growing interest in using herbal remedies and traditional medicinal plants to find effective treatments for this ailment. Celosia argentea Linn, with its long history in traditional medicine and increasing scientific evidence, it was found to be effective in treating various diseases. This overview introduces the plant's characteristics, traditional uses, and potential for treating urinary stones disorders, highlighting its importance in modern medicine.*

Celosia Argentea Linn :

Synonym :[3]

Botanical Name: Celosia argentea linn.

English Name: Silver cockscomb, flamingo feathers, white cockscomb.

Hindi Name: Garkha, garke.
Marathi Name: Kurdu-kurda.

Taxonomical Classification :[4]

Kingdom: plantae – plantsSubkingdom: tracheobionta – vascular plants
Superdivision : spermatophyta – seed plants
Division: magnoliophyta – flowering plant
Class: magnoliopsida – Dicotyledons
Subclass: caryophylliadae
Order: caryophyllales
Family: Amaranthaceae
Genus: celosia
Species: celosia argentea linn.

Biological Source:

Celosia argentea herb commonly known as silver cock's comb or as plumed cockscomb. It is a flowering plant. Its biological source is the plant itself. It is found all over India, Japan, China, Nepal and Tropical Africa. It is an annual or perennial herbaceous plant and it includes biological material such as leaves, flowers, seeds, and roots.

Fig. 1) Flower of celosia argentea

Geographical Source:[5]

Celosia argentea is native to a wide range of regions such as Africa, Asia and the Americas. It is a multicultural plant found in various parts of the world. Geographically, it is found in different countries such as India, Japan, China, Nepal, Bhutan, tropical Africa and regions with suitable growing conditions. The specific geographical source should vary depending on where it was cultivated or grows naturally in the wild.

Collection & cultivation :[6] *Collecting Celosia Argentea herb from its natural origin involves first identification of the plant by its morphological and taxonomical features. Then gently uprooting the whole* *plant with its roots and later transplanting it into our garden. To cultivate Celosia Argentea in our garden, select a sunny location and prepare the soil by enriching it for optimal plant growth. We can plant Celosia seeds or young seedlings by providing them water sufficiently and supplying suitable plant fertilizer for proper growth.*

Composition of celosia argentea Linn :[7]

Celosia argentea Linn contains the following nutritional composition for about every 100 grams of edible portion:

- Water: 83.3 grams
- Energy: 186 Kilojoules (44 Kcal)
- Protein: 4.7 grams
- Fat: 0.7 grams
- Carbohydrate: 7.3 grams
- Dietary Fiber: 1.8 grams

It's important to note that young leaves harvested in 5-7 weeks after sowing are notably rich in iron, vitamin A, and vitamin C. The leaves also contain phytic acid (120 mg/100 g) and oxalic acid (20 mg/100 g). The composition of Celosia argentea Linn is affected by environmental factors such as soil fertility, fertilizer and the age of the plant.

Calcium (Ca): 260 mg

Phosphorus (P): 43 mg

Iron (Fe): 7.8 mg

The chemical composition of Celosia argentea Linn comprises a diverse range of compounds. These constituents are:

1. 2-Descarboxy-betandin

2. 3-Methoxytyramine

3.4-O-β-D-apifuranosyl-(1→2-β-D-glucopyranosyl-2-hydroxy-6-methoxyacetophenone)

4. Amaranthin

5. Betalimic acid

6. Celogenamide A

7. Celogentin A-D, H, J, and K

8. Celosin E, F, G

9. Cristatain

10. Dopamine

11. Lyciumin A methylate

12. Lyciumin C methylate

13. Morodin

14. Nicotinic acid

15. (S)-Tryptophan

In addition to these, this herb also contains other chemical compounds such as acetic acid, tartaric acid, malic acid, citric acid, ascorbic acid and oxalic acid.[8] These various compounds contribute to the plant's chemical nature and may have significance in its potential pharmacological properties.

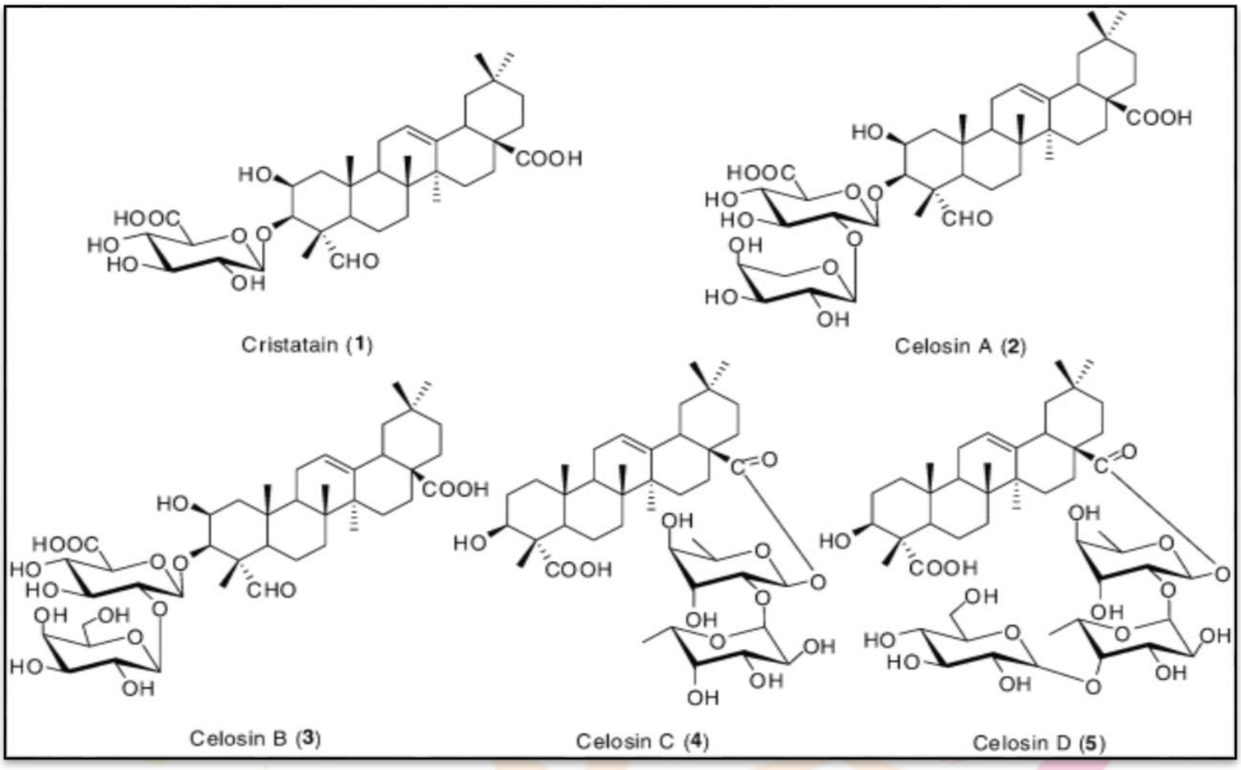

Fig. 2) chemical structures of celosia argentea Linn. [9]

Microscopic characters : [6]

Celosia argentea herb is an upright herb that can reach heights 0.2 to 0.4 meters. It has numerous ascending branches, lanceolate leaves with smooth surfaces and slender petioles. The stem has a width of 2 to 3 centimeter. The inflorescence is dense spike with many flowers arranged along it. The perianth segments are 6-10 millimeter long, narrowly elliptic, oblong and pointed at tip. The filaments are delicate and mostly free with staminal sheath that has rounded edges and very small intermediate teeth-like structures. The anthers and filaments have a creamy to magenta-like colour and the stigma is short and 5-7 millimetres in length.

Micro - morphology: [6]

1) ***T. S. of root :***

Cork Layer: The outermost layer of the root serves as a protective covering of diameter measuring 3-5 µm. Irregular-shaped cells having a size of 5-6 x 6-8 µm.

Vascular Strand: The stele is made up of vascular strands, each consisting of both phloem and xylem.

Xylem Elements: The components of xylem have diameters ranging from 4-5 x 4.5-5 µm.

Phloem Parenchyma: Within the vascular strands the phloem parenchyma elements vary in size around 1.5-2 x 2.5-3 µm in diameter.

2) T. S. of stem:

In a plant stem the outermost layer is the epidermis which is made up of closely arranged barrel-shaped cells with thick walls, each measuring about 3.4 x 2.5-3 µm in diameter. The *epidermis is followed by cortex consisting of 4-7 layers of cells measuring 2.5-3 x 3-3.5 µm. The cortex is then followed by a stele and the stele is bordered by a single-layered closely arranged endodermis. The endodermis has 2 to 3 layers of pericycle, consisting of phloem parenchyma like cells.*

3) T. S. of leaf:

*The transverse section of the leaf shows a bilayer of epidermis. Consisting of an upper and lower epidermis. Both epidermal layers are made up of densely packed thick-walled cells and both are covered with a cuticle. The upper epidermal cells measure about 4-5µm in width and 1.5-5µm in length. Palisade cells, which are rich in chlorophyll have a width of about 2-3µm and a length **of** about 8-12µm. The Spongy parenchyma is also rich in chlorophyll and this is situated between two palisade layers. In the center of the T.S., there is a vascular strand enclosed by bundle like sheath cells. These bundle sheath cells surround the phloem and xylem.*

4) Trichomes and stomata number:

Celosia argentea herb contains a rare presence of uniserate multicellular trichomes on the leaf margin. Additionally, this plant has Tetracytic-type stomata, which have sizes measuring from 5-6 x 3-4 µm.

Figures:

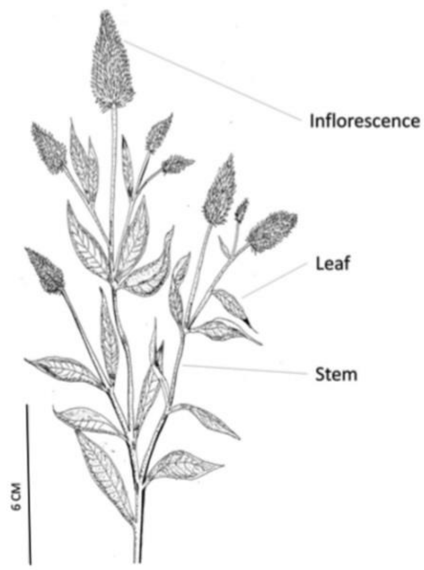

Fig. : celosia argentea (Habit)

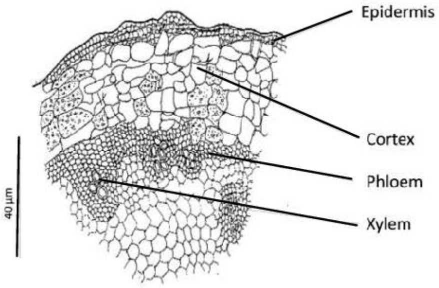

Fig. : T. S. of stem

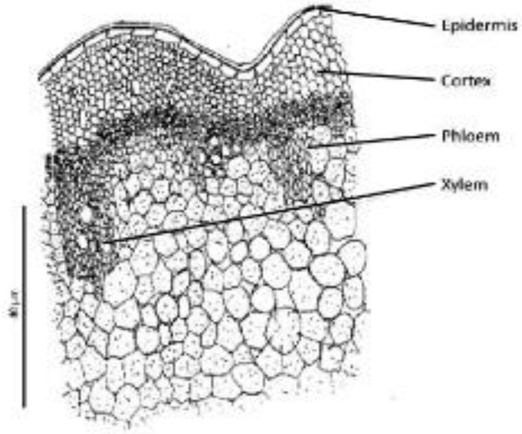

Fig. : T.S. of root

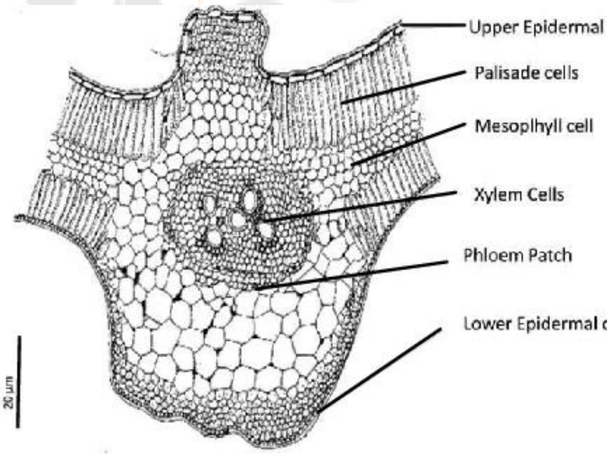

Fig. : T.S. of leaf

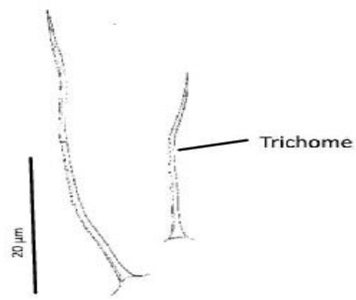

Fig. : Trichome

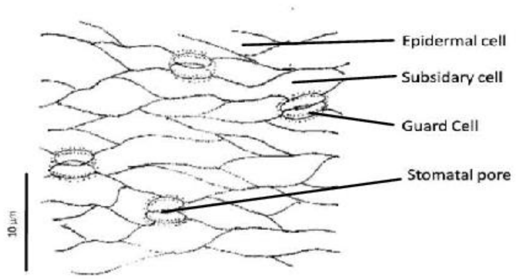

Fig. : Stomata

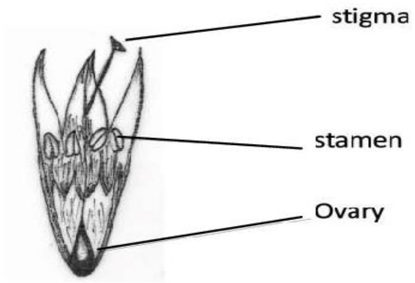

Fig. : T.S. of flower

Anti-urolithiatic activity :[10]

Joshi and colleagues tested that the Celosia argentea herb could prevent kidney stones in albino rats. They found that rats given 250 kg and 500 kg doses of Celosia argentea extract extracted by the soxhlet extraction technique had less kidney stone formation compared with the rats given a standard treatment. This suggests that the Celosia argentea might be effective in preventing kidney stones.

In their study, Joshi Pranav and colleagues investigated Celosia argentea, also known as silvers cockscomb, which could help prevent kidney stones. They conducted several experiments to see if the extract from this plant could stop the formation of these painful stones [11-12] in the urinary tract.

What They Found:

1. The extracts of Celosia argentea were effective in preventing the formation of crystals in the urine of rats.

2. These extracts also helped to stop the crystals from sticking together, reducing the risk of kidney stone formation in experimental animals.

3. The researchers concluded that Celosia argentea shows a positive effect as a natural remedy for preventing urinary stones.

4. They studied and observed laboratory tests to see that the extract of this herb prevents crystals from forming which is the first step in the development of kidney stones.

5. They also tested that the extract could stop these crystals from sticking together and forming larger stones.

Animal :

They used healthy adult male Wistar Albino rats with weight between 250-300 grams. The rats were kept in a controlled environment with a temperature of 25°C and humidity of about 55%, followed with a 12-hour light and 12-hour dark cycle. The rats were given regular food and water at all times. For study on rats Ethical approval was obtained from the Institutional Animal Ethics Committee in line with CPCSEA guidelines.

Plant material and extraction:

They collected Celosia argentea seeds from a forest in Bambar, Valpoi-Goa. Then the seeds were identified at KLE's Shri B.M. Kankanwadi Ayurved Mahavidyalaya in Karnataka and one sample was stored with Voucher No. CRF/12/704. After collection seeds were shade-dried, then ground into a powder. Ethanol was used to extract the contents inside the seeds using a Soxhlet extractor.[13-14] *The extract was then collected by evaporating the ethanol, and then the amount obtained was recorded and used.*[15]

Experimental Protocol:

The study used male Wistar albino rats to test the prevention of urolithiasis. Firstly, kidney stones were formed in rats by inducing ethylene glycol.[16] *Then the rats were divided into five groups with six rats in each group and the experiment was conducted for 28 days. Before and after the study, the rats were weighed and all were provided with regular and similar food and water.*

Except for Group 1, all rats were given 0.75% v/v ethylene glycol in their drinking water to induce kidney stones. Group 1 was the normal control group while Group 2 served as the disease control group. Then Group 3 was treated with Cystone, a standard drug for treating kidney stones, at a dose of 750 mg/kg. Groups 4 and 5 received with 250 mg/kg and 500 mg/kg of ethanolic extract of Celosia argentea seeds (CaE). All rats were given extract and drug orally once a day for continue 28 days.

At the end of the experiment, samples of blood, urine, and kidney tissue were collected for further analytical studies.

*- *Group 1*: Normal control*

*- *Group 2*: Disease control (0.75% ethylene glycol in drinking water)*

*- *Group 3*: Standard treatment (0.75% ethylene glycol + 750 mg/kg Cystone, orally)*

*- *Group 4*: Low dose treatment (0.75% ethylene glycol + 250 mg/kg CaE, orally)*

*- *Group 5*: High dose treatment (0.75% ethylene glycol + 500 mg/kg CaE, orally)[17]*

Result and Conclusion (Anti-urolithiatic activity) :

The study showed that the Celosia argentea ethanol extract (CaE) in both low (250 mg/kg) and high (500 mg/kg) doses, effectively able to prevent weight loss, reduces urine output and prevented urine from becoming too alkaline. It lowers kidney stone-promoting substances like calcium and oxalate. And also preserves stone inhibitors like citrate and magnesium. The higher dose (500 mg/kg) was more effective than the lower dose (250 mg/kg). Histological analysis of celosia argentea Linn confirmed its protective effect against the formation of kidney stones. This supports the traditional use of Celosia argentea for treating kidney stones. However, the exact mechanism of action of this herb needs further study.

Other pharmacological activities:

Anti-diabetic activity :

Vetrichelvan and colleagues[18] found that the alcoholic extract of Celosia argentea seeds shows anti-diabetic activity in rats. They observed that a significant decrease in blood glucose levels in diabetic rats treated with the extract of celosia argentia seeds. Additionally, the ethanolic extract of roots of this herb also shows blood glucose-lowering (blood sugar) effects in both normal and diabetic rats. It reduces cholesterol, triglyceride, and urea levels as well as improves liver glycogen levels in diabetic animals.[19]

Wound healing activity :

Priya and colleagues[20] 2014 conducted a study on celosia argentea extract showing the positive effects on wound healing activity. They used an ointment made from an alcoholic extract of Celosia argentea leaves. Their study revealed that the wounds treated with this ointment healed faster compared to untreated open wounds. The treated group's wounds closed in 15 days while the untreated group took 30 days. Additionally, the treated wounds show increased levels of collagen and hexosamine in granulation tissue which indicates faster healing.

Immunostimulant activity :

Koji and colleagues[21] studied the immune-boosting properties of Celosian. It is a polysaccharide found in the Celosia argentea herb. Their study shows that Celosian triggers the production of tumor necrosis factor-alpha (TNF-α) in mice and stimulates the production of interleukin-1 beta (IL-1β) and nitric oxide (NO) in a macrophage cell line. Additionally, Celosian promoted IL-1β secretion in human mononuclear cells and this enhances the activity of gamma interferon (IFN-γ) in mice spleen cells. However, Celosian alone significantly did not impacts the production of IFN-γ. The researchers concluded that the Celosian possesses immunostimulating properties.

Antimicrobial Activity :

Gbadamosi et al.[22] conducted a study where they tested the antimicrobial effects of ethanolic extract of the roots of Celosia argentea herb on bacteria. Their results shows that the extract was particularly effective against E. coli and S. aureus. This study also reveals the plants root has useful nutritional and phytochemical properties. Then the researchers suggested that these plants roots *could be a cost-effective source for herbal medicines, food supplements and animal food better than being discarded as waste.*

Similarly, Gnanamani et al.[23] used the disc-diffusion method to test the effects of Celosia argentea Linn on eight burn-related pathogens. Their results shows significant antibacterial activity.

Antifungal activity :

Diéméléou et al.[24] conducted a study on the antifungal properties of the n-hexane extract of Celosia argentea seed oil. They found that the seed oil was effective against fungi such as Aspergillus fumigatus, Candida tropicalis and Trichophyton mentagrophytes with a minimum inhibitory concentration of about 50%. So the researchers suggested that these antifungal properties could be useful in pharmaceuticals and cosmetics.

IgE antibody suppression activity :

Imaoka et al.[25] studied the effects of extracts of Celosia argentea and Cucurbit amoschata on the production of anti-DNP IgE antibodies in mice. They founds that the production of IgE antibodies was reduced while IgG responses remained unchanged. Additionally Celosia argentea extract shows dose-dependent mitogenic activity. After that the researchers concluded Celosia argentea extract should be more effective than Perilla frutescens extract (PFE) in suppressing the IgE antibodies in allergic conditions.

Antimitotic activity :

Kobayashi et al.[26] reported celogentins A,B and C. A group of antimitotic bicyclic peptides obtain from the seeds of Celosia argentea plant. These compounds inhibits tubulin polymerization and indicates that the seed extract has antimitotic properties. The inhibition mechanism of celogentins may involve macrophage activation.

Similarly, Morita et al.[27] studied moroidin, it is another bicyclic peptide obtain from the Celosia argentea seeds and founds strongly inhibitor of tubulin polymerization.

Ma et al.[28] did the total synthesis of Celogentin C, a bicyclic peptide having antimitotic activity. They found it inhibits the growth of certain cancer cell lines.

Conclusion :

Celosia argentea was found as a valuable medicinal plant with several pharmacological properties, such as including anti-diabetic, antimitotic, antimicrobial, antifungal, anti-urolithiatic and immunomodulatory activity. This review supports its traditional uses and the growing scientific pieces of evidence supporting its role in managing urolithiasis and various other diseases.

The bioactive compounds found in C. argentea such as flavonoids, saponins and alkaloids contributes to its therapeutic effects, mainly in preventing and treating urinary stones. Additionally, its potential ability to support immune function and combat infections makes it a versatile herbal remedy.

However, further research is needed to develop standard formulations of C. argentea Linn. Also validation of its efficacy through clinical trials and to find synergistic combinations with other drug treatments. With a special focus on its sustainable cultivation, Celosia argentea should be become a key player in modern herbal medicine system, that will offers a natural and effective solutions for managing a range of health conditions.

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