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RESEARCH ARTICLE

Pharmacognostic Standardisation of Whole Plant of *Celosia argentea, var. cristata (L)*

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ABSTRACT

Traditional knowledge of the plants provides widely accepted natural phytoconstituents for treatment of various ailments. The aim of present study is establishment of parameters for authentication and standardisation of *Celosia argentea var. cristata (L.)* Kuntz as is not available in authentic literature. *Celosia argentea var. cristata*, belongs to family Amaranthaceae is an annual herb and is commonly known as cockscomb. It is used for the treatment of fatigue, atherosclerosis, leucorrhoea and osteoporosis. The leaves are used in Chinese medicine to treat dysentery, menstrual bleeding, inflammation and worms. Pharmacognostic investigation including organoleptic, morphological and microscopic characters with anatomy of leaf and stem of plant were done. Moisture content, total ash value, acid insoluble ash, water soluble ash and foreign organic matter were determined for physicochemical evaluation. Preliminary phytochemical evaluation revealed presence of flavonoids, carbohydrates, saponins, sterols, proteins and amino acids. These findings might be useful for identification and standardisation parameters, which is significant for quality control of herbal drugs.

KEYWORDS

Pharmacognostic investigation, *Celosia argentea var. cristata*, Amaranthaceae

INTRODUCTION

The role of plants for the cure of diseases is known to mankind since ancient time. In India, traditional as well as allopathic systems of medicine are used. Main obstacle in the acceptance of herbal drugs is its proper documentation and quality control. Most of the research in pharmacognosy has been done for identification of controversial species of traditionally used plants and their authentication through morphological, phytochemical and physicochemical analysis. Stepwise pharmacognostic study is needed for the identification and authentication of the plants used as a resource of medicines.

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Pharmacognostic studies not only ensure plant identity and lay down standardization parameters but also are helpful for identification and prevention of adulterations. Such studies ensures reproducible quality of herbal products which will lead to safety and efficacy of natural products.[1,2]

With this approach, pharmacognostic study of *Celosia argentea var. cristata* is conducted to investigate morphological, microscopical, physicochemical and fluorescence characteristics.

It is an ornamental plant of family *Amaranthaceae* commonly known as Cockscomb, Red Cockscomb, Foxtail Amaranth, Crested Celosia and Fire-flame Bush.[3] It is nonwoody plant, grows 0.5 to 2 feet

in height. It is grown commonly in Africa, South America, India and some parts of Asia.[4] Leaves are alternate, simple and saggitate or arrow shaped. Leaf shows entire margin, pinnate venation. These are 2-4 inches in length and greenish purple or red in colour. Flowers are red in colour.[3] Plants are distributed in Burma, China, India, Japan, Malaysia, Mexico, Philippines.[5]

MATERIALS AND METHOD

The plant material was collected from various parts but with same habitat in the region around Nashik city. Herbariums and voucher sample were prepared, deposited in Botanical survey of India, Pune (Voucher no. BSI/WRC/Tech/2014) and was authenticated.

Healthy and fully grown plants were selected for the collection of different parts like leaves, roots and stem in fresh condition. These were used for macro and microscopical studies. Whole plants were washed to remove impurities and dried in shade.

Macroscopic Evaluation

Various organoleptic and macroscopic characters of *Celosia argentea var. cristata* like colour, shape of various plant parts, size, taste, fracture of stem bark, inflorescence, leaf characters like margin, apex, colour, odour, base, surface, venation, leaves arrangement etc. were evaluated. Measurements of parameters such as leaf size and petiole length were recorded.

Microscopic Evaluation

Thin transverse sections of fresh root, leaf and stem were taken. Sections were treated with chloral hydrate solution to observe clear image. Sections were stained for detection and localization of various chemicals like starch, proteins, lignin, calcium oxalate and mucilage in the tissues.

All sections were observed under Trinocular Microscope, CH20i model, and photomicrography was performed. Leaf constants like stomatal number, stomatal index, palisade ratio, etc were determined using camera lucida.[6]

Powder Drug Characterisation

Plants were dried under shade, powdered and passed through sieve no 60. Powder was stored in airtight container and was used for microscopical observation. Powder was also used for various chemical tests for carbohydrates, saponins, tannins, oils, etc.[7,8]

Physicochemical Evaluation

Physicochemical parameters of *Celosia argentea var. cristata* were determined. Moisture content was determined using both-loss on drying and azeotropic distillation methods. The total water and alcohol soluble extractive values were obtained by cold maceration method to find out soluble phytoconstituents. Total ash, water soluble ash and acid insoluble ash values were accomplished using standard methods as per Indian Pharmacopoeia.[9]

Fluorescence Analysis

Air dried powder of whole plants, leaves and flowers were separately observed under ultraviolet light for fluorescence analysis as per Chase and Pratt.[10] A small quantity of dry whole plant powder is placed on grease free clean glass slide and to it 1-2 drops of freshly prepared reagent solution was added, mixed by gentle tilting the slide. After few minutes slide was placed inside the UV chamber and observed the colour in visible light, short (254 nm) and long (365nm) ultra violet radiations. The colour observed by application of different reagents in different radiations was recorded.[11]

Phytochemical Evaluation

Whole plant powder was also subjected for successive soxhlet extraction by using solvents like pet ether, chloroform, ethanol and water to obtain extracts. These extracts were then used for phytochemical evaluation. Various chemical tests were conducted to detect presence of phytoconstituents like carbohydrates, proteins, amino acids, saponins, flavonoids, phenolic substances, etc. in it.[12]

RESULTS

Macroscopical Characteristics

Figure 1: *Celosia argentea var. cristata* Plant

Figure 2: *Celosia argentea var. cristata* Leaves

Celosia argentea var. cristata stem is greenish purple in colour and cylindrical with 1-1.5cm in diameter.

Leaves- These are simple and arranged alternately. Young, small leaves are also seen among older. Leaves show saggitate shape and pinnate venation. Leaves are greenish purple on both the sides and about 2-10cm in length and 1-5cm in width. It is bitter in taste and having characteristic odour.

Flowers- These are bright red in colour like cockscomb. It shows tight, fluffy and velvety texture.

Microscopical Characteristics

The transverse section of leaf (figure 3) through midrib shows prominent below and narrow ridge above. It shows the upper and lower single layered compactly arranged rectangular shaped epidermis with thick cuticle and glandular trichomes. Below upper epidermis lie single layer of palisade parenchyma in lamina which is discontinuous in the midrib portion followed by spongy parenchyma. In the midrib portion, at the centre 4-5 vascular bundles are radially arranged. Underneath epidermis 3-6 rows of collenchymatous tissues are observed.

Transverse section of stem (figure 5) shows single layer of epidermis, cellulosic parenchymatous cell i.e. cortex and groups of collenchymatous tissue. The endodermis with its casparian strip is present just outside a circular ring of vascular tissues. Small groups of pericyclic fibers are seen at the intervals. Vascular bundles consist of non-lignified phloem and lignified xylem. Parenchymatous pith contains starch.

Transverse section of root (figure 6) shows outer 3-4 rows of cork cells followed by 8-10 rows of parenchymatous phelloderm. At the center vascular bundles are arranged radially.

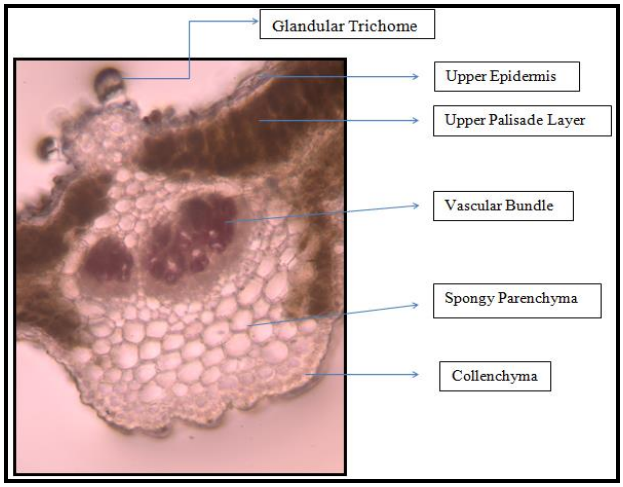

Figure 3: Transverse section of *Celosia cristata* leaf (100X)

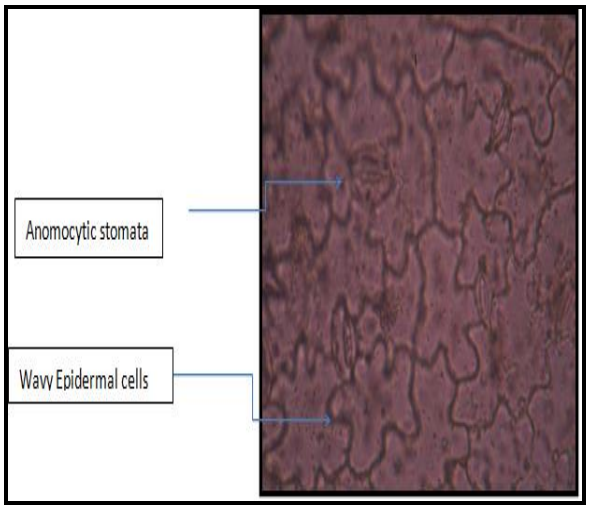

Figure 4: Anomocytic Stomata and wavy epidermal cells

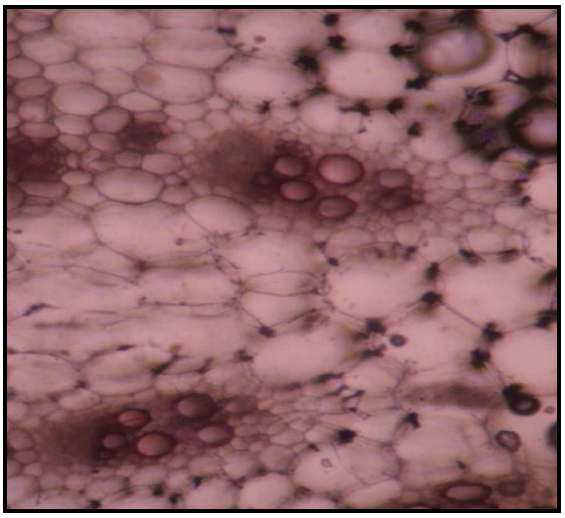

Figure 5b: V.B. enlarged at 400X

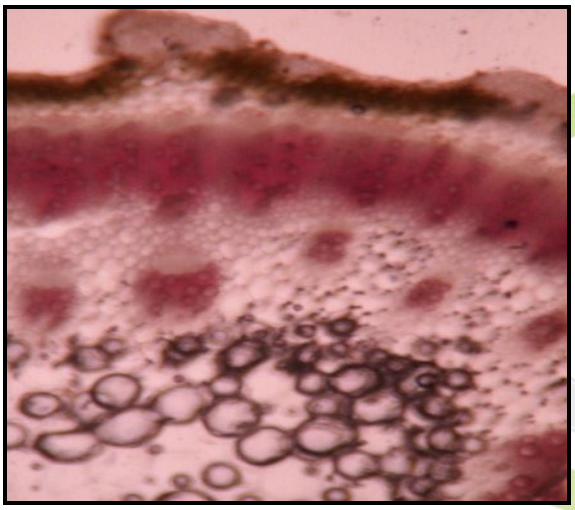

Figure 5a: T. S. of *Celosia argentea var. cristata* Stem 100X

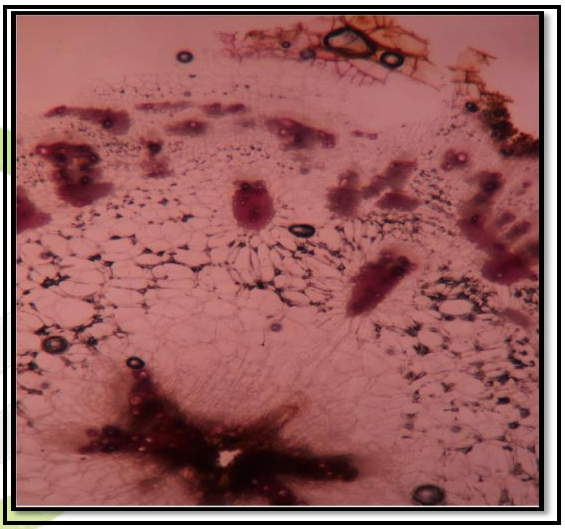

Figure 6: T. S. of *Celosia argentea var. cristata* Root (100X)

Table 1: Characteristics of Extracts

Extract	Colour	Odour	Consistency	% yield (Extractive value)
Pet Ether	Greenish Brown	Characteristic	Sticky	1.25
Chloroform	Greenish Brown	Characteristic	Sticky	2.34
Ethanol	Brown	None	Solid	6.87
Water	Brown	None	Powder	10.7

Physico-chemical Evaluation

Percentage extractive values and physical characteristics of different extracts of *Celosia cristata* have been mentioned in the Table 1. High water soluble extractive value indicates presence of polar compounds. Results of physicochemical analysis are shown in the Table 2.

Table 2: Physicochemical Characteristics and Quantitative Microscopy

Parameter	% w/w
Total Ash Value	5.54
Acid Insoluble Ash	1.14
Water Soluble Ash	2.78
Sulphated Ash	0.8
Moisture Content (Azeotropic Distillation Method)	5.4
Loss on Drying	5.8
Stomatal Number	172
Stomatal Index	25

The fluorescence analysis of the powder of *Celosia cristata* in various solvents and chemical reagents under normal day light and ultraviolet light is given in Table 3.

Table 3: Fluorescence Analysis

S. N.	Treatment	Observation Under Visible Light UV Light	
1	Powder as such	Brown	Yellowish brown
2	1N NaOH (Aq)	Reddish brown	Dark brown
3	1N NaOH (Alcohol)	Reddish brown	Dark brown
4	1N HCl	Dark brown	Greenish brown
5	1% H_2SO_4	Dark brown	Greenish brown
6	1% Nitric Acid	Brown	Greenish brown

Table 4: Phytochemical Analysis

S.N.	Chemical Test For	Pet Ether Extract	Chloroform Extract	Ethanol Extract	Aqueous Extract
1	Carbohydrates	-	-	+	+
2	Proteins	-	-	+	+
3	Amino acids	-	-	+	+
4	Fats and oils	-	-	-	-
5	Alkaloids	-	+	+	+
6	Saponins	-	-	+	+
7	Flavonoids		+	+	+
8	Tanins and Phenolic compounds	-	-	+	+
9	Gums and mucilages	-	+	+	+
10	Steroids	+	+	-	-
11	Triterpenoids	+	+	-	-

Preliminary Phytochemical Screening

Phytochemical screening of various extracts revealed presence of carbohydrates, flavonoids, alkaloids, steroids, terpenoids, tannins and saponins.

CONCLUSION

The quality and purity of herbal drug depends upon geographical source, cultivation techniques, harvesting methods, use of fertilizers and adulteration. Standardisation data of drugs is useful for identification and quality control of drug and thus ultimately its formulation. Phytochemical evaluation of drug will be useful for isolation of various constituents from the drug and subjecting it for thorough pharmacological screening. Quantitative estimation provided can be useful for compilation of monograph of the plant and for its acceptance globally.

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