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A study on phytochemical screening of *Celosia argentea var. cristata* inflorescence extract

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Abstract
Plants being the most abundant on the earth contain many bio resources chemicals in them which are required for making many medical drugs for curing enumerous diseases such as asthma, arthritis, cancer etc. These chemicals or bioactive constituents are present naturally in any parts of the plant like bark, leaves, flowers, roots, fruits, seeds, etc. *Celosia argentea var. cristata* is also one of the plant use specially for medicinal purpose in the olden times. The phytochemical screening of this plant is done in this study from the extract obtained after mixing the powdered sample with 50% ethanol as solvent making the solid to solvent ratio of 1:20g/ml and treating to microwave power of 240Watt for 65sec. The study reported that *Celosia argentea var. cristata* extract was found to contain starch, cellulose, flavonoids, saponin, tannins, phenols, terpenoids and steroids.

Keywords: Celosia, inflorescence, bioactive constituents, phytochemical screening

Introduction
Medicinal plants provide the richest source of organic chemicals on earth and are use as drugs of traditional systems of medicine, modern medicines, nutraceuticals, food supplements, folk medicines, pharmaceutical intermediates and chemical entities for synthetic drugs. Hence plants are regarded as the chemical factories due to the presence of abundant phytochemicals which are the chemicals or bioactive constituents present naturally in any parts of the plant like bark, leaves, flowers, roots, fruits, seeds, etc. These phytochemicals become highly favoured due to their countless medicinal uses as it can fight against plenty of diseases such as asthma, arthritis, cancer etc. The most important property of these bioactive constituents of plants is that they are more effective with little or no side effects in compared to the commonly used synthetic chemotherapeutic agents. The phytochemical analysis is done with the purpose of discovering new bioactive compounds in the plant materials that may lead to their quantitative estimation and also in locating the source of pharmacologically active chemical compounds. Based on the function in plant metabolism, phytochemical are found to be divided into two groups namely, primary and secondary metabolites. The major constituents of primary metabolites consists of carbohydrates, amino acid, protein and chorophyll while secondary metabolites of alkaloids, saponins, steroids, flavonoids, tanins and so on (Hemantkumar, 2016)[2]. The anti-inflammatory, antispasmodic, anti-analgesic and can be attributed to their high steroids, tannins, terpenoids and saponins. Pharmaceutical preparations derived from natural sources such as fruits, vegetables or any plant materials often contain compounds that contribute to the antioxidant defense systems and apparently play a role in the protection against degenerative diseases. Since the phytochemicals cure diseases without causing any harm to human beings these can also be depicted as ecofriendly and manfriendly medicines. Some of the phytochemicals with their mechanism of action is given in Table 1.

Table1: Mechanism of action for some phytochemicals (Tiwari *et al*., 2011**)**

Phytochemicals	Activity	Mechanism of action
Quinones	Antimicrobial	Binds to adhesins, complex with cell wall, inactivates enzymes
Flavonoids	Antimicrobial	Complex with cell wall, binds to adhesins
	Antidiarrhoeal	Inhibits release of autocoids and prostaglandins, Inhibits contractions caused by spasmogens, Stimulates normalization of the deranged water transport across the mucosal cells, Inhibits GI release of acetylcholine
Polyphenols and tannins	Antimicrobial	Binds to adhesins, enzyme inhibition, substrate deprivation, complex with cell wall, membrane disruption, metal ion complexation
	Antidiarrhoeal	Makes intestinal mucosa more resistant and reduces secretion, stimulates normalization of deranged water transport across the mucosal cells and reduction of the intestinal transit, blocks the binding of B subunit of heat-labile enterotoxin to GM1, resulting in the suppression of heat-labile enterotoxin-induced diarrhea, astringent action
	Anthelmintic	Increases supply of digestible proteins by animals by forming protein complexes in rumen, interferes with energy generation by uncoupling oxidative phosphorylation, causes a decrease in G.I. metabolism
Alkaloids	Antimicrobial	Intercalates into cell wall and DNA of parasites
	Antidiarrhoeal	Inhibits release of autocoids and prostaglandins
	Anthelmintic	Possess anti-oxidating effects, thus reduces nitrate generation which is useful for protein synthesis, suppresses transfer of sucrose from stomach to small intestine, diminishing the support of glucose to the helminthes, acts on CNS causing paralysis
Saponins	Antidiarrhoeal	Inhibits histamine release in vitro
	Anticancer	Possesses membrane permeabilizing properties
	Anthelmintic	Leads to vacuolization and disintegration of teguments
Steroids	Antidiarrhoeal	Enhance intestinal absorption of Na+ and water
Terpenoids and essential oils	Antimicrobial	Membrane disruption
	Antidiarrhoeal	Inhibits release of autocoids and prostaglandins

Celosia argentea var. cristata is a member of the genus *Celosia* of edible and ornamental plants belonging to family Amaranthaceae. The *Celosia argentea* comprises of two group that is Plumosa and Cristata group, cristata group give brilliant hues and the flower looks like the head on a rooster (cock) hence it is given its name as cockscomb. The plant genus Celosia is native in subtropical and temperate zones of Africa, South America and South East Asia consisting of about 60 species. They are found to grown as foods in India, Western Africa, and South America. Cristata Group plants like *Celosia argentea var. cristata* flower colors include bright shades of orange, red, purple, yellow and pink. In South-East Asia, the flowers are used as medicine for dysentery, haemoptysis and menstruation problems. The plants is use as medicine for curing many diseases such as dysentery, coughs, spitting up blood, excessive menstruation, amenorrhea, intestinal bleeding, bleeding from the lungs, female disorders, hemorrhoids, UTI, blood diseases, mouth sores, retinal hemorrhage, conjuntivitis, eye diseases and to lower blood pressure. *Celosia argentea var. cristata* contains betalains which are water-soluble nitrogen-containing pigments that are subdivided in red-violet betacyanins and yellow-orange betaxanthins. According to Varadharaj & Muniyappan, 2017 [11], large number of studies suggested that, the *Celosia* species possess antidiabetic, anti-inflammatory, antioxidant, anti-bacterial, anti apoptosis, antidiarrhoeal, anthelmintic, antiaging, antimalarial, antiplasmodic, hepatoprotective and immunostimulating activities. Several researchers carried out phytochemical analysis on different colours and parts such as leaf, stem, roots, seed, etc of *Celosia argentea* by Karthiyayini & Nithiya, 2015 [4]; Ranjan & Deokule, 2013 [7]; Varadharaj & Muniyappan, 2017 [11] and Hemantkumar, 2016 [3]. Despite of being so much important and highly regarded plant due to many health benefit effects, phytochemical analysis of the extract from the flower or inflorescences should be carried out to know the bioactive chemicals present and in addition due to its brilliant hues present, it can be also used for functional food colorants. The main objective of this study is to extract and conduct phytochemical screening of the *Celosia argentea var. Cristata* extract.

Materials and Methods

Chemicals

Various chemicals such as ethanol (solvent-food graded chemicals), sodium acetate, hydrochloric acid, potassium chloride, sodium hydroxide, mercuric chloride, potassium iodide, potassium chloride, ferric chloride, sodium acetate, lead acetate, iodine solution, sulphuric acid, chloroform, acetic acid, copper sulphate, potassium hydroxide and Fehling's solution were used for analysis and are listed as analytical reagent grade.

Plant material

Celosia argentea var. Cristata (dark pink colour) inflorescences were the raw materials used in this study which were grown in abundance and locally available inside the campus of G. B. Pant University of Agriculture and Technology, Udham Singh Nagar, Uttarakhand, India.

Preparation of Sample

The *Celosia argentea var. cristata* inflorescences were first cleaned by removing the unwanted stem, leaves, seed and damaged part of the plant. The cleaned flowers were washed, dried by fluidised bed dryer at 50ºC until it is crisp enough to be grinded to powder using grinder. The powders obtained were stored in sealed plastic pouches in room temperature until further usage.

Preparation of Celosia extract

The stored powder samples of 1g were taken in a flask and 50% ethanol solution were added to it to attain the solid to solvent ratio of 1:20g/ml. The mixture was then exposed to microwave power of 240W for treatment period of 65sec. The main motive of using microwave assisted extraction is to apply microwave to the plant matrix containing solvent and

ground sample which will leads to the rupturing of the cell wall due to increase temperature and pressure. As a result leads to release of phytochemical which remains bounded with the cell. After the treatment, the sample were kept for 24hrs and then centrifuged at 4000g for 10min. The supernatant collected were filtered using Whatman filter paper 2 and then stored in refrigerator for further analysis.

Phytochemical Screening of Celosia extract

Qualitative determination of phytochemical analysis was carried out from the extract by performing the following tests.

1. Test of Alkaloids (Karthiyayini & Nithiya, 2015) [4]

To 1ml of the extract, 2ml of Mayer's reagent was added. Appearance of dull white precipitate indicated the presence of alkaloids. Mayer's regent: Dissolve 1.36g of Mercuric chloride and 5 g of potassium iodide in distilled water separately, mix both solutions and make it up to 100 ml with distilled water.

2. Test for Flavonoids (Karthiyayini & Nithiya, 2015) [4]

To 1ml of extract, 1ml of neutral ferric chloride was added. The formation of brown colour confirmed the presence of flavonoids.

3. Test for Tannin (Karthiyayini & Nithiya, 2015) [4]

To 1ml of the extract, few ml of 5 percent neutral ferric chloride was added. The development of a dark bluish colour indicated the presence of tannins.

4. Test for Phenols (Karthiyayini & Nithiya, 2015) [4]

To 1ml of extract, lead acetate solution was added and the precipitate formation indicated the presence of phenolic compounds.

5. Test for Steroids (Karthiyayini & Nithiya, 2015) [4]

Liebermann-Burchard's test: The extracts were dissolved in 2 ml of chloroform to which 10 drops of acetic acid and 5 drops of concentrated sulphuric acid were added and mixed. The change of red colour through blue to green indicated the presence of steroids.

6. Test for Terpenoids (Karthiyayini & Nithiya, 2015)

Salkowski test: 5ml of each extract was mixed in 2ml of chloroform and 3ml concentrated sulphuric acids were carefully added to form a layer. A reddish brown colouration of the interface was formed to show positive results for the presence of terpenoids.

7. Test for Quinone (Karthiyayini & Nithiya, 2015) [4]

To 1ml of extract, a few drops of concentrated hydrochloric acid were added. A yellowish brown colour is observed which shows the presence of quinine.

8. Test for Starch (Karthiyayini & Nithiya, 2015) [4]

To 1ml of extract, a few drops of iodine solution and detection of any characteristic colour change show the presence of starch.

9. Test for Cellulose (Karthiyayini & Nithiya, 2015) [4]

To 1ml of extract, a few drops of iodine solution are added followed by a few drops of sulphuric acid. Dark brown or red colour observed shows the presence of cellulose.

10. Test for saponin (Karthiyayini & Nithiya, 2015) [4]

The extract (50 mg) is diluted with distilled water and made up to 20 ml. The suspension is shaken in a graduated cylinder for 15 minutes. A two cm layer of foam indicates the presence of saponins.

11. Test for Gum and Mucilages (Whistler & Bemiller, 1993) [12]

The extract 100mg is dissolved in 10 ml of distilled water and to this, 25ml of absolute alcohol is added with constant stirring. White or cloudy precipitate indicates the presence of gums and mucilages.

12. Test for Protein (Gahan, 1984) [2]

Biuret test: 2 ml of filtrate is treated with 1 drop of 2% copper sulphate solution. To this 1 ml of ethanol (95%) is added, followed by excess of potassium hydroxide pellets. Pink colour ethanolic layer indicates the presence of protein.

13. Test for Fixed oils (Sahira & Cathrine, 2015) [8]

Spot test: A small quantity of extract is pressed between two filter papers. Oil stain on the paper indicates the presence of fixed oils.

Results and discussion

Phytochemical screening

Phytochemical screenings were carried out from the extract and the following results obtained were shown in Table 2 and therefore it was shown that the extract of *Celosia argentea var. cristata* was found to contain starch, cellulose, flavonoids, saponin, tannins, phenols, terpenoids and steroids. The phenolic compounds being one of the largest and most ubiquitous groups of plant metabolites appeared to possessed biological properties such as anti-apoptosis, anti-aging, anti-carcinogen, cardiovascular protection and improvement of endothelial function and cell proliferation activities. Terpenoids molecules may be found to have contain useful anticancer properties. Saponins have the property of precipitating and coagulating red blood cell. Steroids have been reported to antibacterial properties and they are very important compound especially due to their relationship with compounds such as sex hormone (Hemantkumar, 2016) [3]. It has been also reported that tannin containing drugs have been shown to posses anti - diabetic properties. Tannins have been found to inhabit the cell protein synthesis and form irreversible complexes with proline rich protein (Shimada *et al.*, 2006) [9] resulting in the inhibition of cell protein synthesis. Parekh & Chanda, 2007 [5] reported that tannins are known to react with proteins to provide a protein complex which may have importance in the treatment inflamed or ulcerated tissues or cancer. According to Dharmananda, 2003 [1], plants that have tannins as their main component are astringent in nature and are used for treating intestinal disorders such as diarrhoea and dysentery. Flavonoids are a major group of compounds that act as primary antioxidants or free radical scavengers and they are reported by Ramamurthy & Sathiyadevi, 2017[6] to be better antioxidants and have multiple biological activities including vasodilatory, anti-carcinogenic, anti-inflammatory, antibacterial, immune-stimulating, anti-allergic, antiviral and radioprotective effects.

Table 2: Phytochemical analysis of the extract of *Celosia argentea var. cristata*

Sl. No.	Phytochemical Test (Name of the compounds)	Indication
1.	Alkanoids	Absent
2.	Starch	Present
3.	Cellulose	Present
4.	Flavonoids	Present
5.	Tannin	Present
6.	Quninone	Absent
7.	Phenols	Present
8.	Terpenoids	Present
9.	Steriods	Present
10.	Saponin	Present
11.	Gum and mucilages	Absent
12.	Protein	Absent
13.	Fixed oils and Fats	Absent

Conclusion

Phytochemical screening of the plant is helpful for the standardization of drug by verifying the effectiveness and safety of folk medicines. The extract of *Celosia argentea var. cristata* was found to contain starch, cellulose, flavonoids, saponin, tannins, phenols, terpenoids and steroids. The identified phytochemical proved that the plants are an increasingly valuable reservoir of bioactive compounds of substantial medicinal merit. Not much work has been carried out on this plant (*Celosia argentea var. cristata*) and ample works are needed to bring the changes in the medicinal and food world. Qualitative and quantitative analysis of bioactive materials present in the plant extract can also be carried out further in the future.

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