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Extraction, Prediction of Molecular Properties and Anthelminthic Effects of *Celosia Argentea*

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Abstract: *Medicinal plants are widely used in traditional systems of medicine because of their therapeutic potential and reduced side effects. The present study was aimed at extraction, prediction of molecular properties, and evaluation of anthelmintic activity of* Celosia argentea*. The plant material was collected, dried, pulverized, and extracted using Soxhlet extraction with ethanol as solvent. Phytochemical screening was performed to identify major bioactive constituents. Molecular prediction studies were carried out for selected compounds to evaluate drug-like properties. Anthelmintic activity of ethanolic extract was evaluated using* Pheretima posthuma *earthworms by recording paralysis time and death time at different concentrations. Phytochemical analysis confirmed the presence of alkaloids, flavonoids, tannins, saponins, glycosides, and phenolic compounds. Molecular prediction studies indicated that selected compounds satisfied Lipinski's Rule. The extract showed concentration-dependent anthelmintic activity, with 100 mg/mL concentration exhibiting significant activity comparable to Albendazole. The study supports the traditional medicinal use of* Celosia argentea *and suggests its potential as a natural source for herbal anthelmintic agents.*

Keywords: Celosia argentea*, Anthelmintic activity, Phytochemical screening, Soxhlet extraction, Molecular prediction, Herbal medicine.*

I. INTRODUCTION

Medicinal plants have been used since ancient civilization for the prevention and treatment of various diseases. Plants synthesize numerous chemical compounds that possess therapeutic activities beneficial to human health. Herbal medicines are gaining global importance because they are considered safer, cost-effective, and easily available compared to synthetic medicines. According to the World Health Organization (WHO), nearly 80% of the world population depends on herbal medicines for primary healthcare. Medicinal plants serve as an important source for the development of modern pharmaceuticals. Drugs such as quinine, morphine, atropine, and digoxin were originally derived from plants.

Herbal drugs are formulations prepared from leaves, roots, stems, bark, seeds, flowers, or whole plants. These drugs contain biologically active compounds responsible for pharmacological activity. Advantages of herbal drugs include less toxicity, economical availability, better patient tolerance, reduced side effects, suitability for long-term use, and rich source of bioactive compounds.

Helminthiasis refers to infections caused by parasitic worms known as helminths. These parasites mainly inhabit the gastrointestinal tract of humans and animals and cause nutritional deficiency, anemia, abdominal pain, diarrhea, weakness, and impaired growth. Helminths are broadly classified into nematodes, cestodes, and trematodes. Millions of people worldwide suffer from helminthic infections, particularly children and immunocompromised individuals.

Anthelmintics are agents used to destroy or expel parasitic worms from the body. However, synthetic anthelmintics are associated with drug resistance, adverse effects, high treatment cost, and limited accessibility in rural regions. Therefore, medicinal plants are increasingly explored for alternative anthelmintic agents.

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II. PLANT PROFILE

A. Introduction to *Celosia argentea*

Celosia argentea is an annual herb belonging to the Amaranthaceae family. It is commonly known as silver cock's comb, Lagos spinach, or wool flower. The plant is widely distributed in tropical and subtropical regions including India, Africa, China, and Southeast Asia.

The plant has long been used in traditional medicine for diarrhea, fever, mouth sores, skin infections, eye disorders, and intestinal worms.

B. Taxonomical Classification

Category	Classification
Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Order	Caryophyllales
Family	Amaranthaceae
Genus	Celosia
Species	*Celosia argentea*

C. Vernacular Names

Language	Name
English	Silver Cockscomb
Hindi	Sitivara
Marathi	Kurdu
Sanskrit	Shitivaraka
Tamil	Kozhi Keerai

Different parts of the plant such as leaves, seeds, and flowers possess medicinal properties due to the presence of bioactive phytochemicals.

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D. Important Bioactive Compounds

Compound	Pharmacological Activity
Quercetin	Antioxidant
Kaempferol	Anti-inflammatory
Betaine	Hepatoprotective
Celosian	Immunomodulatory

III. AIM AND OBJECTIVES

A. Aim of the Study

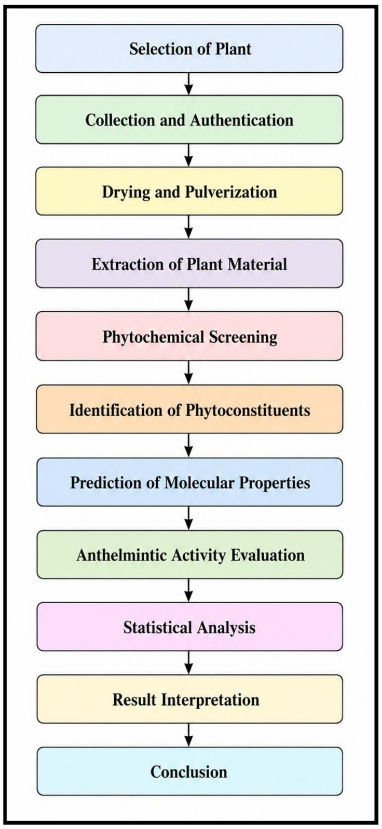
To carry out extraction, prediction of molecular properties, and evaluation of anthelmintic activity of *Celosia argentea*.

B. Objectives of the Study

- To collect and authenticate *Celosia argentea* plant material.
- To prepare plant extract using suitable extraction techniques.
- To perform phytochemical screening of the extract.
- To identify important phytoconstituents responsible for biological activity.
- To predict molecular properties of selected phytochemicals using computational approaches.
- To evaluate the anthelmintic activity of plant extract against earthworms.
- To compare the activity of extract with standard anthelmintic drug.
- To analyze and interpret experimental results statistically.

Stepwise Plan of Work

- Literature survey
- Selection of medicinal plant
- Collection and authentication
- Drying and powdering
- Extraction using Soxhlet apparatus
- Concentration of extract
- Phytochemical screening
- Identification of bioactive compounds
- Prediction of molecular properties
- Preparation of test solutions
- Anthelmintic activity evaluation
- Observation and recording of results
- Statistical analysis
- Interpretation and conclusion



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IV. MATERIALS AND METHODS

A. Plant Material

Fresh whole plant/leaves of *Celosia argentea* were collected from local areas and used for extraction and phytochemical investigation.

B. Chemicals and Reagents

Chemical/Reagent	Purpose
Ethanol	Extraction solvent
Methanol	Solvent
Distilled water	Preparation of solutions
Mayer's reagent	Alkaloid test
Dragendorff's reagent	Alkaloid test
Ferric chloride	Tannin test
Lead acetate	Flavonoid test
Sodium hydroxide	Flavonoid test
Concentrated sulfuric acid	Glycoside test
Chloroform	Phytochemical test
Albendazole	Standard anthelmintic drug
Normal saline	Experimental medium

C. Instruments and Equipment

Instrument	Purpose
Soxhlet apparatus	Extraction
Rotary evaporator	Solvent evaporation
Beakers and conical flasks	Experimental work
Measuring cylinder	Volume measurement
Glass rods	Mixing
Filter paper	Filtration
Stopwatch	Recording paralysis/death time

D. Methodology

Methodology

The complete methodology adopted in the present study included:

1. Collection of plant material
2. Authentication
3. Drying and pulverization
4. Extraction
5. Phytochemical screening
6. Molecular property prediction
7. Anthelmintic activity evaluation
8. Statistical analysis

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Drying and Pulverization

Procedure

1. Collected plant material washed thoroughly.
2. Shade drying carried out for 7–10 days.
3. Dried material pulverized using grinder.
4. Powder passed through sieve.
5. Stored in airtight container.

Extraction of Plant Material

Soxhlet Extraction Method

Soxhlet extraction was used for obtaining phytoconstituents from powdered plant material.

Principle

Continuous hot extraction allows repeated contact between solvent and plant material, resulting in efficient extraction of active constituents.

Procedure for Soxhlet Extraction

Step-by-Step Procedure

1. About 100 g of dried powdered plant material was accurately weighed.
2. Powder packed inside Soxhlet thimble.
3. Ethanol was used as extraction solvent.
4. Solvent heated in round bottom flask.
5. Vapors condensed and solvent continuously percolated through plant material.
6. Extraction continued for 6–8 hours until siphon tube solvent became colorless.
7. Extract filtered through filter paper.
8. Solvent evaporated using rotary evaporator.
9. Concentrated extract stored in desiccator for further studies.

V. PHYTOCHEMICAL SCREENING

A. Objectives of Phytochemical Screening

To identify bioactive constituents present in the plant extract.

To correlate phytochemicals with biological activity.

To determine therapeutic potential of the plant.

To support pharmacological evaluation.

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B. Major Phytochemicals Present in Plants

Alkaloids
Flavonoids
Tannins
Glycosides
Saponins
Steroids
Phenolic compounds
Terpenoids

Phytochemical	Biological Activity
Alkaloids	Anthelmintic, analgesic
Flavonoids	Antioxidant, anti-inflammatory
Tannins	Anthelmintic, antimicrobial
Saponins	Membrane disruption
Glycosides	Cardiotonic activity
Phenolics	Free radical scavenging

VI. ANTHELMINTIC ACTIVITY

Helminthic infections are caused by parasitic worms affecting humans and animals. These infections lead to malnutrition, weakness, anemia, and gastrointestinal disorders. Medicinal plants are increasingly investigated as alternatives to synthetic anthelmintics.

A. Objective

To evaluate the anthelmintic activity of ethanolic extract of *Celosia argentea*.

B. Experimental Model

Pheretima posthuma (Indian Earthworm)

Earthworms were selected because they are physiologically similar to intestinal parasites, easily available, and suitable for preliminary screening.

C. Procedure

Earthworms were washed with saline and different extract concentrations were prepared. Worms were exposed to test solutions and paralysis time and death time were recorded.

D. Parameters Evaluated

Paralysis Time

Time required for worms to lose movement.

Death Time

Time taken for complete death.

Treatment	Paralysis Time	Death Time
Albendazole	18 min	30 min
Extract 25 mg/mL	42 min	65 min
Extract 50 mg/mL	30 min	52 min
Extract 100 mg/mL	20 min	36 min

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Procedure

1. Earthworms washed with saline.
2. Different extract concentrations prepared.
3. Worms exposed to test solutions.
4. Paralysis time recorded.
5. Death time observed.

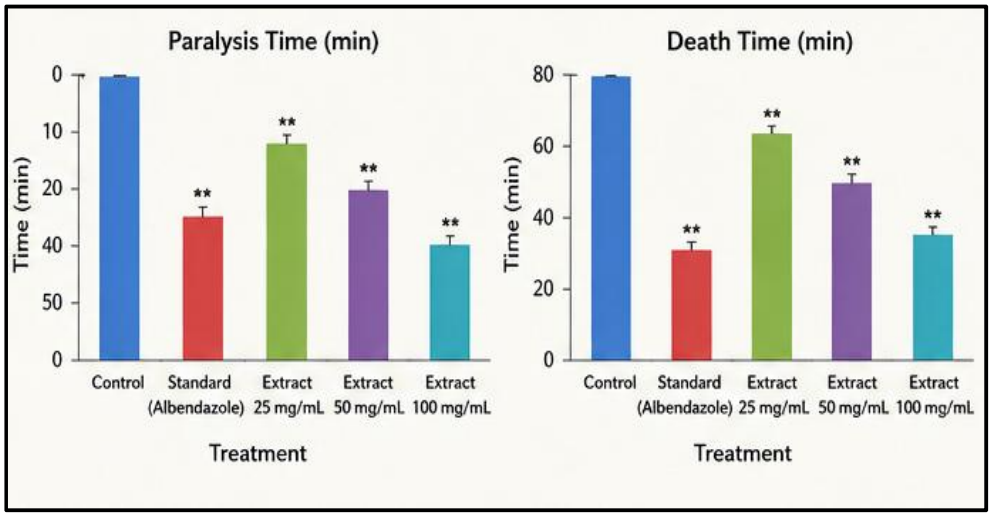
Parameters Evaluated

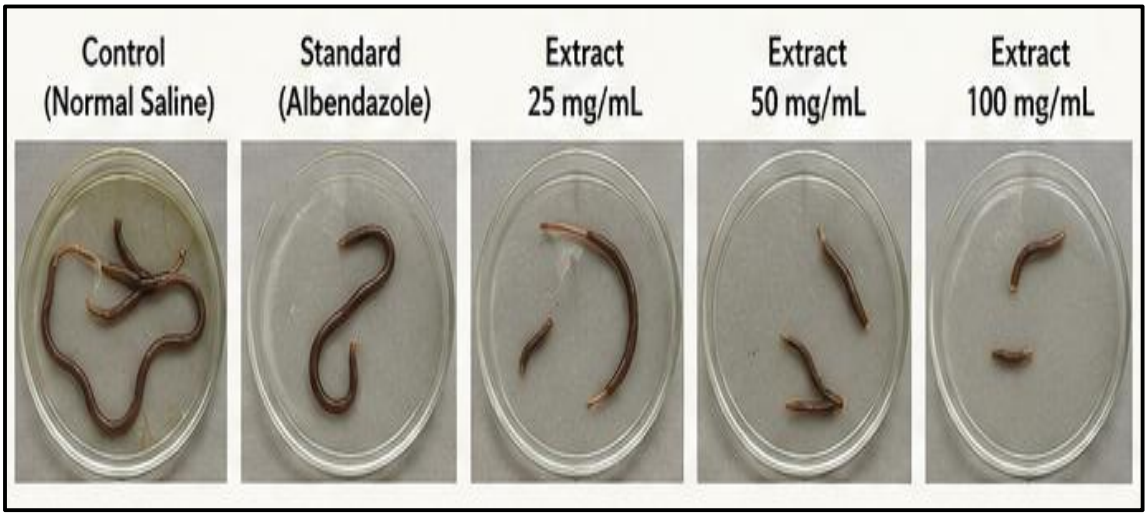
Paralysis Time

- Time required for worms to lose movement.

Death Time

- Time taken for complete death.





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VII. RESULTS AND DISCUSSION

The present investigation evaluated phytochemical composition, molecular properties, and anthelmintic activity. Results obtained demonstrated significant medicinal potential of *Celosia argentea*.

A. Extraction Yield

Ethanol efficiently extracted phytoconstituents because polar and semi-polar compounds dissolved effectively and continuous extraction improved yield.

B. Phytochemical Screening

Phytochemical analysis confirmed the presence of alkaloids, flavonoids, tannins, saponins, and glycosides.

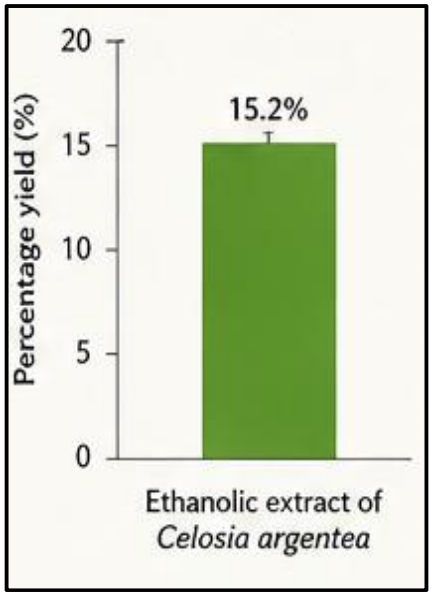
C. Molecular Prediction

Selected compounds satisfied Lipinski's Rule indicating favorable drug-like properties.

D. Anthelmintic Activity

The extract exhibited concentration-dependent activity. Higher concentrations showed reduced paralysis and death time, indicating enhanced anthelmintic efficacy.

The identified phytoconstituents are known for antioxidant, antimicrobial, and anthelmintic activities, which may contribute to the observed pharmacological effects.



VIII. CONCLUSION

The present investigation demonstrated that *Celosia argentea* contains important phytoconstituents with promising medicinal properties. Molecular prediction studies indicated favorable drug-like characteristics, while the ethanolic extract exhibited significant dose-dependent anthelmintic activity.

The study supports the traditional use of *Celosia argentea* and suggests its potential as a natural source for development of safer and effective herbal anthelmintic agents.

Future Scope

- Future work may include:
- Isolation of active compounds
- Molecular docking studies
- Toxicity evaluation

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- Clinical studies
- Herbal formulation development

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