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Evaluation of Antidepressant Activity of Various Extract of *Celosia cristata* Fruits and Leaves by Using Forced Swim Test

Gupta Anjali¹, Shinde Manoj Gangadhar², Kolhar Sana R.³, Sharma Reena⁴, Ponnudurai K.⁵, Bhambar Kunal V.⁶, Kavitha C.⁷ and Venkatachalam Prabakaran^{8*}

¹Galgotias College of Pharmacy, Knowledge Park II, Greater Noida 201310, Uttar Pradesh, India

²K. K. Wagh College of Pharmacy, Hirabai Haridas Vidyanagari, Amrutdham, Panchavati, Nashik 422003, Maharashtra, India

³Department of Zoology, Anjuman Art's, Science and Commerce College, Vijayapura 586101, Karnataka, India

⁴Ravishankar College of Pharmacy, Ayodhya Bypass Road, Bhanpura Square, Bhopal 462037, Madhya Pradesh, India

⁵Department of Pharmacology, Arulmigu Kalasalingam College of Pharmacy, Anand Nagar, Krishnankoil, Virudhunagar 626126, Tamil Nadu, India

⁶Department of Pharmaceutical Quality Assurance, MGV's Pharmacy College, Panchavati, Nashik 422003, Maharashtra, India

⁷Bannari Amman Institute of Technology, Erode 638401, Tamil Nadu, India

⁸Jawaharlal Nehru Technological University, Hyderabad, India

*Corresponding Author

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Abstract: The components of the plant used in these studies were bought from a store. The fruits and leaves of *Celosia cristata* were and then ground into a coarse powder. Ethanol, petroleum ether, and chloroform were used in to remove the chemicals. The dry marks on these parts were mixed with warm distilled water and then filtered. The extractives were evaporated with less pressure. One way to get water extractives was to heat a plate in a ceramic dish and let the water drain on it. Albino mice were used to test the antidepressant effect. There was no plan for picking the creatures. Researchers looked at how ethanol, petroleum ether, chloroform, and water extracts from *Celosia cristata* fruits and leaves could help people who are depressed. It was mixed with Tween 80 to hold the dried ingredients, which were then mixed with pure water. Ipramine, the prescribed medication, was taken just as directed. Antidepressant medication was detected using the Forces Swim Test (FST). Half an hour before to the commencement of the test, dosages of 50, 100, 150, and 200 mg/kg of imipramine and other extracts were administered. Each group had a minimum of six animals. Utilising Dunnett's Method and one-way analysis of variance, we compared each extractive separately with imipramine (standard) and the control. $P < 0.001$ was accepted to show that the results were statistically significant.

Keywords: *Celosia cristata*, Central nervous system, Forced Swim Test, Antidepressant activity

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Introduction

Adrenergic systems are in the brain and the spinal cord. They are made up of catecholamines, adrenaline, noradrenaline, and dopamine (Al-Snafi, 2016). A small group of these adrenergic neurons spread out from the limbic system and help the frontal brain release catecholamines. Here, happiness, alertness, and stress responses are linked to the catecholaminergic circuits (Ahire *et al.*, 2022). The main neurotransmitter that affects the excitatory dopamine systems in the CNS is serotonin. Brain cells that make serotonin control memory, emotions, sex drive, and hunger (Rengasamy *et al.*, 2021). The main cell bodies of the noradrenaline and serotonin systems are found in the brainstem. The brainstem is where axonal impulses are sent along specific paths that control specific processes (Keservani *et al.*, 2017). Many noradrenergic and serotonergic pathways may not work right in people with depression, which can lead to a lot of different symptoms (Ahire *et al.*, 2023).

Several ideas about the biological reasons of sadness have been put forward in the past (Al-Snafi, 2017). These are a few of the most important ones, along with what they mean. It is now generally agreed that sadness is more likely to be caused by an imbalance in a number of control systems than by a lack of a single neurotransmitter in the brain (Hasanat *et al.*, 2019). People all over the world are still interested in medical plants because they could be used in medicine, and pharmacology. Plant-based therapies include a lot of methods that have been shown to work as medicines and for which biological and pharmacological data is available (Surana *et al.*, 2023). These kinds of studies will definitely help find new, useful chemicals or find ways to change existing ones to make powerful medicines.

The aim of this study was to find out if *Cleosia cristata*, could help with depression by looking at its phytochemical, pharmacological, and toxicological properties (Rajabian *et al.*, 2022).

Materials and Methods

Solvents like petroleum ether, chloroform, alcohol, and water-based liquids were used in the extraction process. These are drugs that are classified as analytical tools (Bailly, 2021).

Plant collection and extraction technique for Cleosia cristata:

The fruits and leaves of *Cleosia cristata* were collected and kept in the shade. They were cut into small sizes, ground into a coarse powder, and then put through sieve #10. A Soxhlet apparatus, petroleum ether (60–80°C), chloroform, and ethanol (95% v/v) were used to separate the 200 g of roughly powdered leaves and fruits. The process continued until a few drops of the last fraction of the elution did not leave any residue that could be observed after drying (Sharma *et al.*, 2018). Final dry mark created by combining all three components with heated distilled water and sifting them. Lower pressure solvent loss occurred when the extractives were dried using a Rotavapour apparatus (Lu *et al.*, 2016). A porcelain dish was placed over a hot plate and water extract was allowed to evaporate to create water extractives. Following their preparation, the phytochemicals, colour, and potential for treating depression were assessed for the petroleum ether, chloroform, ethanol, and water extracts (Keservani *et al.*, 2017).

Physical evaluation of extracts:

Different fruit and leaf extracts are looked at physically to find out what chemicals they contain and what colours they have (Mishra *et al.*, 2016). Phytochemical study was done according to the standard procedures laid out in plant pharmacopoeia (Keservani *et al.*, 2023).

Evaluation of Biological Activity:

Animals:

Albino mice that weighed 20 to 25 g were used in the study. The animals had unrestricted access to food and water and were housed in a typical 12 h light/dark cycle (Keservani *et al.*, 2010). The

Table 1: Colour of leaves extract of *Cleosia cristata* in various solvents

Leaves extracts in various solvents	Colour of extract in various solvents
Water	Blackish Brown
Ethanol	Brown
Chloroform	Yellowish brown
Petroleum ether	Green

Table 2: Colour of fruit extract of *Cleosia cristata* in various solvents

Fruits extracts in various solvents	Colour of extract in various solvents
Water	Blackish Brown
Ethanol	Brown
Chloroform	Yellowish brown
Petroleum ether	Yellowish

animals, both male and female, were picked at random (Li *et al.*, 2022).

Preparation of test and standard solution:

For dispensing the extractive and standard medication doses, dried extractives were suspended in Tween 80 (2–5%) and subsequently suspended in distilled water (Chia, 2022). The usual medication is imipramine (10 mg/kg). Every medication was freshly manufactured for every trial (Gangwar *et al.*, 2023).

Statistics for biological activity:

There were at least six animals in each group during the trial. The average immobility time $\pm$ Standard Error of Average is how the statistics are reported. Dunnett's Method was used to compare each extractive with control and imipramine (standard) on an individual basis, utilising one-way analysis of variance (ANOVA) (Rizvi and Ali, 2016).

Evaluation of antidepressant activity:

Forced swim test (FST):

Three mouse groups ($n = 6$) were used. Oral Tween 80 suspended in distilled water was administered to the first group (control); 10 mg/kg of imipramine was given to the second group as a reference medicine; and extractives were supplied orally to the third group at doses of 50, 100, 150, and 200 mg/kg (Khairnar *et al.*, 2024). Each mouse was made to swim in an open glass cylindrical jar filled with 15 cm of water at

$25 \pm 1^\circ\text{C}$ as part of the forced swimming test (Ahire *et al.*, 2024). It was noticed that the individual stayed motionless throughout the whole 6 min test period. Decrease in the amount of time spent motionless during the complete sleep test (FST) evaluates the efficacy of antidepressants (Keservani *et al.*, 2017).

Results and Discussion

Extraction of Cleosia cristata:

As stated, the fruits and leaves were dried, ground into a powder, and extracted using water, ethanol, petroleum ether, and chloroform. Tables 1 and 2 provide notes on the hues of the extractives.

Antidepressant activity:

The antidepressant efficacy of *Cleosia cristata* fruits and leaves extractives was investigated. Different extractives have an antidepressant effect in the forced swim test (FST) (Tables 3, 4, 5, 6; Figs. 1, 2, 3, 4).

The parts of the *Cleosia cristata* plant were used in this study. Solutes like petroleum ether, chloroform, ethanol, and pure water were used in the extraction process. The leaves and fruits, were dried and ground into a coarse powder using a Soxhlet device. Then, ethanol, petroleum ether, and chloroform were used in that order to get the oils out of the plant. The dry marks on these parts were mixed with warm distilled water and then filtered. The extractives were evaporated with less pressure. To test the drug, white mice were used.

Table 3: Biological activity of petroleum ether extractives of *Cleosia cristata* in forced swim test (FST)

Parameter	Control (10 ml/kg)	Imipramine (10 ml/kg)	Petroleum ether extractives of leaves (mg/kg)			
			50	100	150	200
Immobility Time (sec)	131	59	133	139	119	117

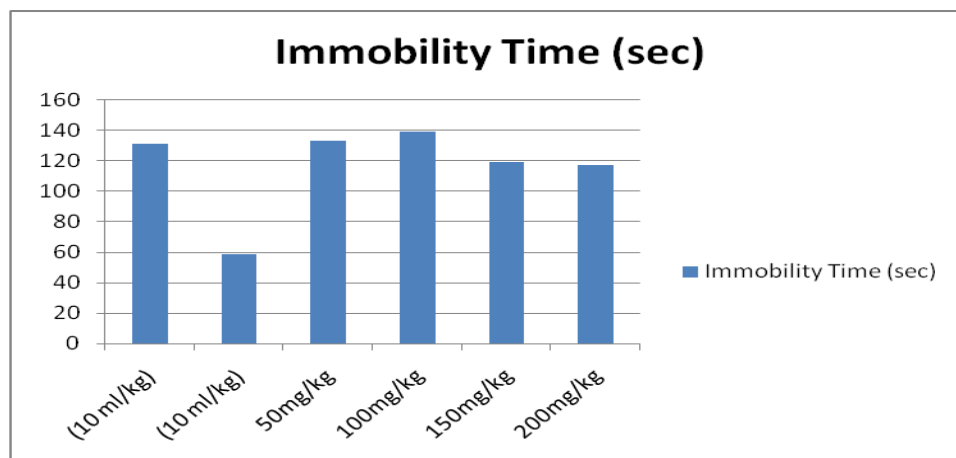


Fig. 1: Immobility time of petroleum ether extract of *Cleosia cristata* in forced swim test (FST).

Table 4: Biological activity of chloroform extract of *Cleosia cristata* in forced swim test (FST)

Parameter	Control (10 ml/ kg)	Imipramine (10 ml / kg)	Chloroform extractives of leaves (mg/kg)			
			50	100	150	200
Immobility Time (sec)	131	59	115	111	109	112

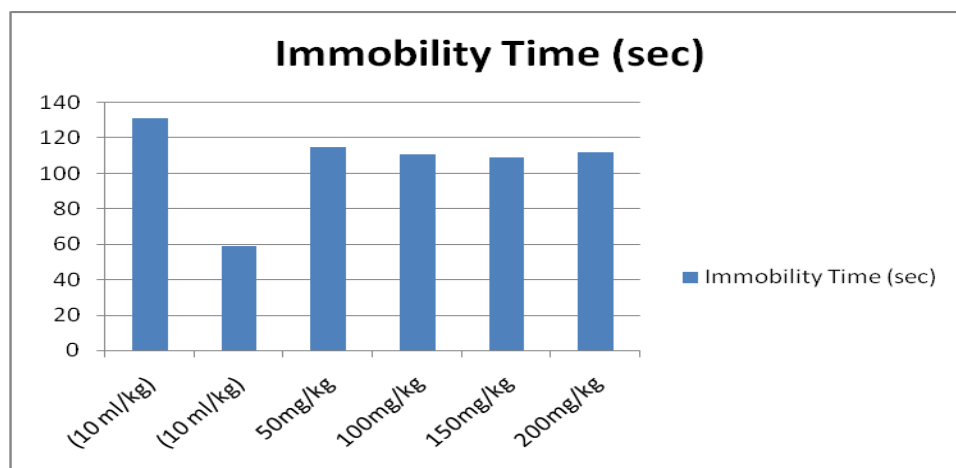


Fig. 2: Immobility time of chloroform extract of *Cleosia cristata* in forced swim test (FST).

Table 5: Biological activity of ethanol extract of *Cleosia cristata* in forced swim test (FST)

Parameter	Control (10 ml/ kg)	Imipramine (10 ml / kg)	Ethanol extractives of leaves (mg/kg)			
			50	100	150	200
Immobility Time (sec)	131	59	75	66	67	59

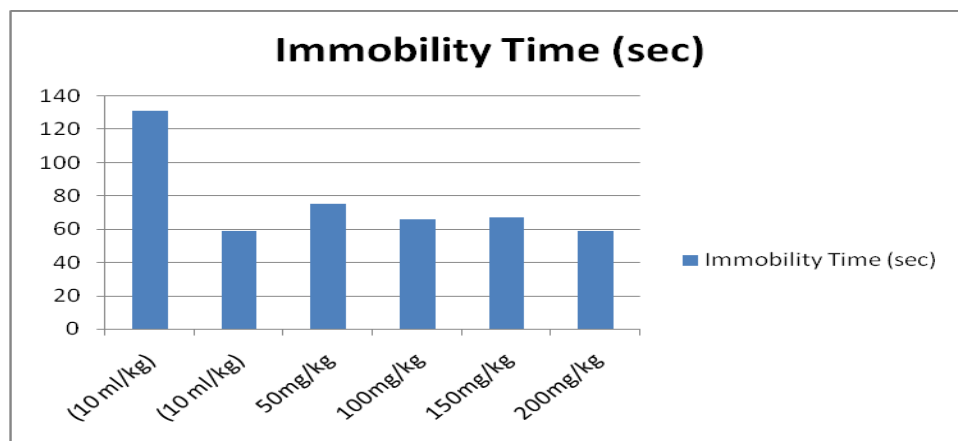


Fig. 3: Immobility time of ethanol extract of *Cleosia cristata* in forced swim test (FST).

Table 6: Biological activity of water extract of *Cleosia cristata* in forced swim test (FST)

Parameter	Control (10 ml / kg)	Imipramine (10 ml / kg)	Water extractives of leaves (mg/kg)			
			50	100	150	200
Immobility Time (sec)	131	59	79	81	83	69

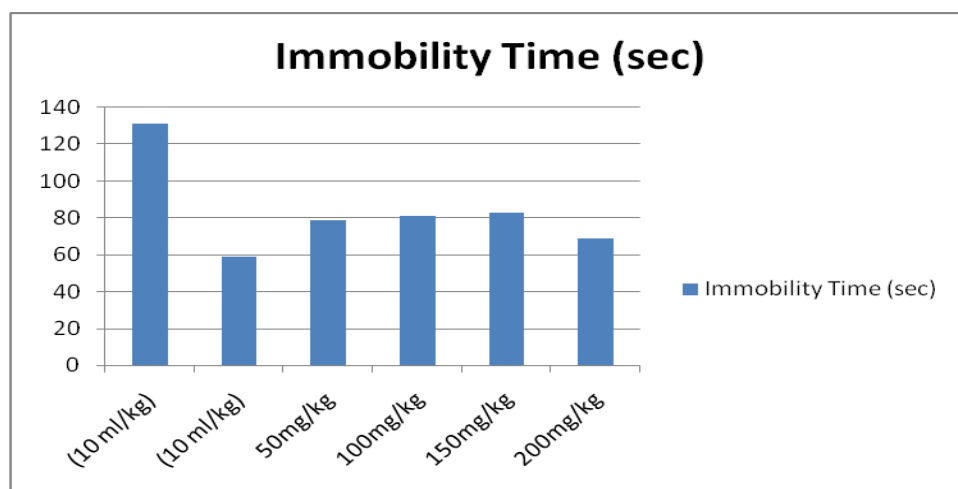


Fig. 4: Immobility time of water extract of *Cleosia cristata* in forced swim test (FST).

This study evaluated at how petroleum ether, chloroform, ethanol, and water extracts from *Cleosia cristata* leaves and fruits, could help people who are depressed. When dried extracts were mixed with Tween 80 (2–5%), they were also mixed with pure water. The recommended drug, imipramine, was taken exactly as instructed. The tail suspension test which is also sometimes called the forced swim test or FST, were used to screen people for antidepressants. The medicine imipramine (10 mg/kg) and other extracts at

doses of 50, 100, 150 and 200 mg/kg were given half an hour before the testing started. It has been shown that plant-based ethanol extractives cut down on the total amount of time that mice are immobile in both animal models by a large amount when given. Flavonoids, polyphenols, and catechins make up most of these substances. These are all the chemicals that work on living things. Some of the other things that are present are proteins, chlorophyll, amino acids, fluoride, volatile organic molecules, aluminium, minerals,

and minor elements. Caffeine, theophylline, and theobromine are all examples of alkaloids. Flavonoids make up most of the polyphenolic chemicals. Animal tests with ethanol extracts from fruits and leaves showed that they were very good at treating depression, according to this study. More studies are needed to be done before a medicine mixture that can be used by humans. Also, it is suggested that clinical tests be done on humans to find out how poisonous *Celosia cristata* is and to get stronger proof that it works as an antidepressant.

Conclusion

According to the findings of this study, ethanol extractives derived from fruits and leaves of *Celosia cristata* have been discovered to have powerful antidepressant effects in animal models. It is recommended that more research be conducted in order to develop a medicine formulation that is suitable for oral consumption by humans. Furthermore, it is recommended that clinical studies be conducted on humans in order to ascertain the toxicity profile of *Celosia cristata* and to collect additional information that demonstrates the usefulness of the antidepressant effect of the medicine.

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