



Analgesic activity of hydroalcoholic extract of leaves of *Colocasia esculenta*

Chandrakanta Kushwah*, Nitu Singh, Raksha Goswami and N. K. Jain

Oriental University, Indore (M.P.) - India

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Abstract

Pain is a mixture of noxious stimuli with sensation. It is commonly observed to be associated with toothache, migraine, inflammation, infection, increased ocular pressure, burn, wound, reduced blood supply to heart, intestinal colic, renal colic, parturition, and various diseases like renal calculi, cancer etc. Nonsteroidal anti-inflammatory drugs and opioid analgesic are normally used in the treatment of pain but can cause a lot of adverse effect. Therefore herbal drugs can be potential source to replace them. Every year a lot of plants form traditional medicinal system has been screened for their potential analgesic activity but only few of them only included in health care system after clinical research. *Colocasia esculenta* is important medicinal plant in India and it is used in various treatment of disease. In this paper, The analgesic activity of Hydroalcoholic extract of *Colocasia esculenta* was evaluated through hot plate and tail flick models. In this study the animals were treated with *Colocasia esculenta* (200mg/kg & 400mg/kg), and standard Diclofenac sodium (5mg/kg). The Hydroalcoholic extract of *Colocasia esculenta* of 200 mg/kg and 400 mg/kg exhibited significant analgesic activity in the hot plate method ($p < 0.01$) by increasing the pain reaction time (PAT) of the rats to sec $34.24 \pm 3.015^{**}$ and $37.28 \pm 3.006^{**}$ respectively at 90 min after treatment in comparison to control (40.26 ± 5.055).

In tail Flick Method Hydroalcoholic extract of *Colocasia esculenta* of 200 mg/kg and 400 mg/kg exhibited significant analgesic activity ($p < 0.001$) by increasing the pain reaction time (PAT) of the rats to sec $4.30 \pm 0.025^{*}$ and $6.13 \pm 0.031^{**}$ respectively at 90 min after treatment in comparison to control (4.26 ± 0.055) The results of the study concluded the *Colocasia esculenta* plant exhibits analgesic activity and further studies of *Colocasia esculenta* plant were suggested to isolate the active principles responsible for the analgesic activity.

Keywords: Analgesic activity, Hydroalcoholic extract, *Colocasia esculenta*, Diclofenac sodium.

Introduction

In recent time, scientific investigations of medicinal plants using indigenous medical systems has attracted a lot of attention globally. Nature has given our planet an enormous wealth of medicinal plants and are highly esteemed all over the world as a rich source of therapeutic agents for the prevention and cure of diseases and ailments. Various injuries are mostly occur with pain. Pain is an unpleasant feeling (sensory) and

emotional experience and it is associated with tissue damage. It is not disorder but a symptom of a disorder. Tissue injury is the instantaneous cause of pain as it releases different chemical mediators like prostaglandins, bradykinins, etc.^(1,2,3)

*Corresponding Author

E-Mail: chandakushwah0@gmail.com

Non-steroidal anti-inflammatory drugs (NSAIDs) are the drugs which reduce pain in higher dose. Side effects include increased risk of the stomach ulcers and heart attacks.^{(4,5)(6)} Analgesic or painkiller are the group of drug used to relief pain without disturbing consciousness. Nonsteroidal anti-inflammatory drugs and opioid analgesic are normally used in the treatment of pain but can cause a lot of adverse effect. Therefore herbal drugs can be potential source to replace them.^{(7),(8)} Every year a lot of plants from traditional medicinal system has been screened for their potential analgesic activity but only few of them only included in health care system after clinical research. *Colocasia esculenta* is important medicinal plant in India and it is used in various treatment of disease *Colocasia esculenta* (Apiaceae) is a tropical perennial plant. The plant leaves are up to 20 to 150 cm and shape is like elephant ear.⁽⁹⁻¹¹⁾ It is indigenous in New Zealand, and west to Indonesia. It is cultivated all over India.^(12, 13) Flavonoids, alkaloids, apigenin, aurotin, anthocyanin, carbohydrates, fiber, minerals, protein, fat, calcium and iron, starch, magnesium, cholesterol, zinc, sodium, potassium and vitamin A, vitamin C, vitamin E, vitamin K, energy, and pyridoxine (B₆), thiamine (B₁), copper, riboflavin (B₂), folates, niacin, pantothenic acid, manganese, selenium etc. are found in the leaves of *Colocasia esculenta*.⁽¹⁴⁾ There was no report on the extensive analgesic activity of the *Colocasia esculenta* leaves of this plant species. To the best of my knowledge, this is the first time the leaves are screened for analgesic activity.

Material and Methods

Plant material

Colocasia esculenta leaves were collected from local market of city, Indore, Madhya Pradesh. *Colocasia esculenta* leaves were identified and authenticated by Mr. "Dr. S N Dwivedi, Head of the department of botany, Janata PG Collage, A.P.S. University, Rewa". Voucher specimen number: is J/Bot./2020-0320.

Preparation of extract

Leaves were collected and dried in shade. The dried leaves were converted into coarse powder. The powdered drug (50 gm) was extracted with Hydroalcoholic solvent (Water 30%+alcohol

70%) until drug was completely extracted. The percentage yield was calculated after drying the extract under vacuum. The extracted drug (*Colocasia esculenta*) was stored in suitable container.⁽¹⁵⁾



Fig. I: Leaves of *Colocasia esculenta*

Animals

Wistar albino rats of either sex weighing (100-150 gm) were selected for the study. The group of animals were housed individually in standard cages at room temperature 22±2°C and 50±5% relative humidity (12 h light/dark cycle). The animals were provided with the standard feed and water *ad libitum*. They were acclimated to the environment for five days prior to experimental use.

Drugs and Chemicals

Diclofenac sodium tablet I.P, Mfg. Lic No: G671, Manufactured by Troikaa pharmaceutical Ltd was used as a standard drug.

Analgesic activity

Animals are divided into four groups and each group contains six animals

Group I- Treated with normal saline solution.

Group II- Treated with diclofenac sodium (hot plate and tail flick method 5 mg/kg)

Group III- Treated rat *Colocasia esculenta* (200 mg/kg).

Group IV- Treated rat *Colocasia esculenta* (400 mg/kg).^(10, 11, 12)

Hot plate method

The rats were placed on a hot plate maintained at 55°C within the restrainer. The reaction time (in seconds) or latency period was determined as the time taken for the rats to react to the thermal pain

by licking their paws or jumping. The reaction time was recorded at 0, 30, 60 and 90 minutes following the administration of *Colocasia esculenta* and diclofenac sodium. The maximum reaction time was fixed at 45 sec to prevent any injury to the tissues of the paws. If the reading exceeds 45 sec, it would be considered as maximum analgesia. ^(16,17)

Tail flick method

Analgesic activity of the *Colocasia esculenta* extract was evaluated by the tail-flick method described [9]. About 5 cm from the distal end of the tail of each rat was immersed in warm water maintained at 50°C. The reaction time (in seconds) was the time taken by the rat to flick its tail due to pain. The first reading was omitted and reaction time was taken as the average of the next two readings. The reaction time was recorded before (0 min) and at 15, 30, 45, and 60 min after the administration of the treatments. The maximum reaction time was fixed at 15 sec to prevent any tail tissue injury. If the reading exceeds 15 sec, it would be considered as maximum analgesia. The maximum possible analgesia (MPA) was calculated as follows: ⁽¹⁸⁾

Statistical analysis

Table 1 – Effect of analgesic activity of Hydroalcoholic Extract of *C. esculenta* in Eddy's hot plate method

Groups	Treatment	Jumping in seconds				
		Dose(mg/k g)	0 min.	30 min.	60 min.	90 min.
I	Control (normal saline)	-	30.23±4.089	30.45±4.188	40.14±5.033	40.26±5.055
II	Standard group (diclofenac sodium)	5 mg/kg	32.29±4.054	35.68±5.048**	38.17±6.005**	38.22±4.005**
III	Test group-I (<i>C. esculenta</i>)	200 mg/kg	21.37±2.046	23.18±3.023*	32.16±2.006*	34.24±3.015**
IV	Test group-II (<i>C. esculenta</i>)	400 mg/kg	31.30±4.057	33.66±3.022**	35.16±4.008*	37.28±3.006**

All values are mean ±SEM (n=6); *p<0.05, **p<0.01, ***p<0.001, when compared to control

Tail flick method

Rats treated with control group of animal (normal saline) did not show any significant difference in reaction time on tail flick throughout the observation time. Standard drug group of animal

The study data is expressed as mean SEM. The study data of analgesic activity is analysed by one way analysis of variance (ANOVA). P< 0.05, P<0.01 was considered as statically significant.

Results and Discussion

Hot plate method

Rats are divided into four groups. Control group of animal (normal saline) did not show any significant difference in reaction time on paw jumping throughout the observation time. Standard drug group of animal showed more significant action as compared to test group (extract) treated animals. The test group of animal (extract) treated group with 200 and 400mg/kg dose showed significant action as compared to control group of animal but less significant action as compared to standard drug group of animal and 5mg/kg dose. The Hydroalcoholic extract of *Colocasia esculenta* of 200 mg/kg and 400 mg/kg exhibited significant analgesic activity in the hot plate method (p<0.01) by increasing the pain reaction time (PAT) of the rats to sec 34.24±3.015** and 37.28±3.006** at 90 min after treatment in comparison to control (40.26±5.055) (Table 1)

showed more significant action as compared to test group (extract) treated animals. The test group of animal (extract) treated group with 200 and 400mg/kg dose showed significant action as compared to control group of animal but less

significant action as compared to standard drug group of animal and 5mg/kg dose. Hydroalcoholic extract of *Colocasia esculenta* of 200 mg/kg and 400 mg/kg exhibited significant analgesic activity ($p < 0.001$) by increasing the pain reaction time

(PAT) of the rats to sec $4.30 \pm 0.025^*$ and $6.13 \pm 0.031^{**}$ respectively at 90 min after treatment in comparison to control (4.26 ± 0.055) (Table 2)

Table 2 –Effect of Analgesic activity of Hydroalcoholic extract of *Colocasia esculenta* in Tail flick method

Groups	Treatment	Tail flick in seconds				
		Dose(mg/kg)	0 min.	30 min.	60 min.	90 min.
I	Control (normal saline)	-	3.23 ± 0.089	3.45 ± 0.188	4.14 ± 0.033	4.26 ± 0.055
II	Standard group (diclofenac sodium)	5 mg/kg	5.19 ± 0.028	$5.48 \pm 0.075^*$	$6.23 \pm 0.041^*$	$6.40 \pm 0.022^{**}$
III	Test group-I (<i>C. esculenta</i>)	200 mg/kg	3.21 ± 0.070	3.34 ± 0.013	$4.05 \pm 0.098^*$	$4.30 \pm 0.025^*$
IV	Test group-II (<i>C. esculenta</i>)	400 mg/kg	4.24 ± 0.095	$5.19 \pm 0.046^*$	$5.25 \pm 0.032^*$	$6.13 \pm 0.031^{**}$

All values are mean \pm SEM (n=6); * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, when compared to control

Conclusion

Hot plate method is based on the rat paw sensitivity to heat at temperatures not damaging the skin which is observed as jumping. *Colocasia esculenta* was found to effect jumping response in the present study, which makes it evident that it is centrally acting. On preliminary phytochemical screening the Hydroalcoholic extract of *Colocasia esculenta* leaves were found to contain sterols, Triterpene and flavonoids, alkaloids, carbohydrates and tannins compounds. Since prostaglandins are involved in the pain perception and are inhibited by flavonoids, it could be suggested that the analgesic effect of *Colocasia esculenta* leaves might be due to its inhibitory action on PG biosynthesis. The analgesic effect produced by the *Colocasia esculenta* leaves may be due to its high content of flavonoids.

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