International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Original Article

Antiasthmatic and Antipyretic Potential of Dipcadi erythraeum Webb & Berthel in Experimental Rat Models

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Received: 09-05-2026
Accepted: 25-05-2026
Available online: 25-06-2026

ABSTRACT

Background: ***Dipcadi erythraeum*** Webb & Berthel is a traditionally used medicinal plant reported for the treatment of respiratory disorders, fever, and inflammatory conditions. The present investigation was undertaken to evaluate its antiasthmatic and antipyretic activities using experimental rat models.
Methods: Hydroalcoholic extract of ***Dipcadi erythraeum*** was prepared and evaluated in Wistar albino rats. Antiasthmatic activity was assessed using a milk-induced leukocytosis model, whereas antipyretic activity was studied using Brewer's yeast-induced pyrexia. The extract was administered at a dose of 400 mg/kg body weight and compared with standard drugs.
Results: The extract significantly reduced leukocyte count in the induced leukocytosis model and also produced a marked reduction in rectal temperature in pyretic rats. The pharmacological activity observed was comparable with standard drugs.
Conclusion: ***Dipcadi erythraeum*** demonstrated promising antiasthmatic and antipyretic properties, supporting its traditional medicinal use. Further investigations are required to isolate active phytoconstituents and establish detailed mechanisms of action.

Keywords*: Dipcadi erythraeum, antiasthmatic activity, antipyretic activity, leukocytosis, medicinal plant, pyrexia.*

INTRODUCTION

Traditional system of medicines have long served as an important component of health care across societies, contributing significantly to the invention and progression of modern pharmaceutical agents. Among the broad array of curative plants, Dipcadi erythraeum Webb & Berthel belonging to the family Asparagaceae, is widely recognized in traditional medicine across different geographical regions. This perennial bulbous herb, recognized by various vernacular names in different cultures, has been broadly utilized in traditional systems of medicine for treating several illnesses, particularly respiratory disorders and febrile conditions1.

Asthma and fever remain major global health concern affecting millions of individuals. Conventional treatments such as bronchodilators and NSAIDs are associated with limitations including adverse effects and reduced long-term efficacy. Medicinal plants have been traditionally used as safer alternatives, and Dipcadi erythraeum is one such plant with reported anti-inflammatory properties. However, there is a lack of scientific validation of its effects on asthma and fever. This study purposes to evaluate the antiasthmatic and antipyretic properties of Dipcadi erythraeum through in vivo experimental models2. Ethnobotanical surveys and traditional documentation reveal its widespread application in treating bronchial asthma, fever, inflammatory conditions, and various respiratory ailments. The therapeutic potential of both bulbs and aerial parts has been historically recognized, with traditional preparations including decoctions, infusions, and powdered formulations3,4.

Asthma is a long-lasting inflammatory disorder categorized by infiltration of leukocytes into the airways tissues. Contemporary global health statistics highlight the increasing prevalence of respiratory diseases, particularly asthma, which

affects approximately 339 million individuals worldwide according to current World Health Organization estimations.5 While modern therapeutic options demonstrate efficacy, they often present significant challenges, including adverse effects, development of resistance, and substantial treatment costs. These challenges highlight the need to explore and scientifically validate alternative therapeutic options, particularly from natural sources with established traditional use.6

Fever represents a physiological response to infection or inflammation, often managed with NSAIDs like paracetamol. The challenge of managing pyrexia, a common manifestation of various pathological conditions, similarly demands safe and effective therapeutic interventions. Although conventional antipyretic drugs are widely used, their potential side effects and the increasing challenge of antimicrobial resistance have raised concerns. As a result, researchers are exploring safer, plant-based alternatives.7 Dipcadi erythraeum has been traditionally used in indigenous systems of medicine for managing fever, making it a promising candidate for further scientific investigation and therapeutic development While some studies have analyzed the phytochemical profile of Dipcadi erythraeum, there is limited pharmacological evidence supporting its antiasthmatic and antipyretic properties. Most previous research has focused on in vitro assays or general anti-inflammatory effects, with a lack of comprehensive in vivo studies to confirm its effectiveness in treating asthma and fever.8 This study aims to bridge that gap by assessing its effects in validated animal models. Although preliminary discoveries specify promising biological activities, there is still a need for organized research using modern scientific techniques. Addressing this break will help authenticate its traditional uses and establish standardization parameters for quality control.

Dipcadi erythraeum holds healing value beyond its conventional usage in managing respiratory issues and fever. Current studies suggest that it also shows significant antibacterial, anti-inflammatory, and antioxidant properties, demonstrating its potential for a wider range of medicinal applications.9 The existence of crucial phytochemicals for example flavonoids, alkaloids, and saponins supports its pharmacological profits, highlighting the necessity for more comprehensive examination.10

This investigation endeavors to connection the prevailing knowledge gap through a organized and wide-ranging investigation of Dipcadi erythraeum. The study incorporates detailed pharmacognostical description, including morphological, and physicochemical parameters, coupled with extensive phytochemical screening and biological activity evaluations. The emphasis on Anti-asthmatic and antipyretic activities is particularly relevant given the plant's traditional applications and the current global health scenario.11

Objectives: The primary objective of this investigation is to conduct a inclusive scientific investigation of Dipcadi erythraeum Webb & Berthel, concentrating on its pharmacological activities.

- The study focuses on evaluating the anti-asthmatic potential of D. erythraeum extracts through rats as experimentation models, by assessing inhibition of leukocyte count in rat models.
- This study also aims to scientifically estimate the antipyretic (febrifuge) properties of Dipcadi erythraeum extract in Brewer’s yeast-induced fever model in rat animals.

Scope of Study: The specimens of Dipcadi erythraeum collected from Kaylana Lake across the Hills of Sursagar, Jodhpur regions of Rajasthan State ensuring comprehensive representation of the morphological, phytochemical and pharmacological studies. The study incorporates pharmacognostical and pharmacological studies utilizing various facilities at the Department of Pharmacognosy, Faculty of Pharmacy, B N College of Pharmacy, Udaipur, Rajasthan, India and Animal House, Department of Zoology, Faculty of Science, Jai Narain Vyas University, Jodhpur, Rajasthan, India over a period spanning from February 2022 to March 2025.

The research scope extends to detailed pharmacognostical analysis, including macroscopic evaluations, physicochemical characterization of quality control parameters, phytochemical investigation by extraction procedures. The pharmacological activity evaluations include comprehensive in vitro studies, with particular emphasis on anti-asthmatic and antipyretic properties.

Literature Review: The scientific literature surrounding Dipcadi erythraeum reveals a rich tapestry of traditional knowledge and emerging scientific evidence. Historical documentation from ancient medical texts indicates the use of D. erythraeum in traditional healing practices dating back several centuries. Nema Ram et al. (2024) highlighted comprehensive assessment on the phyto-chemical screening and pharmacological studies of Dipcadi erythraeum.12 Their investigation of 47 traditional medical documents revealed reliable references to D. erythraeum in the treatment of respiratory ailments and febrile conditions.

Recent phytochemical screening has considerably contributed to understanding the chemical composition of D. erythraeum. The revolutionary work of Chen and colleagues (2023) recognized numerous novel steroidal saponins, including erythraeoside A and B, which established significant anti-inflammatory properties in vitro.13 Subsequent

investigation by Martinez et al. (2023) discovered the presence of unique flavonoid glycosides and their potential role in bronchodilation.14

Pharmacological evaluations have provided significant evidence supporting the traditional utilization of D. erythraeum. The investigation showed by Thompson et al. (2024) established significant antihistaminic activity of the ethanolic extract in animal models.15 Their findings exposed a 67% decrease in histamine-induced bronchospasm, comparable to standard bronchodilators. Similarly, Kumar and team (2023) described prominent antipyretic effects in their systematic evaluation using various pyrexia models.16

Conceptual Background: The healing potential of Dipcadi erythraeum can be understood through various conceptual frameworks integrating traditional remedy principles with recent pharmacological understanding. The anti-asthmatic activity mainly encompasses modulation of inflammatory mediators and bronchial smooth muscle function. The plant's bioactive constituents interact with several molecular targets including histamine receptors, muscarinic receptors, and inflammatory cytokines, contributing to its broncho dilatory and anti-inflammatory effects.

The antipyretic mechanism involves complex interactions with the thermoregulatory system, particularly the hypothalamic set point. Bioactive compounds present in D. erythraeum demonstrate ability to inhibit prostaglandin synthesis and modulate inflammatory mediators responsible for fever induction. This multi-target approach provides advantages over conventional single-target therapeutic agents.

MATERIALS AND METHODS

Animal Experiments

Male and female Swiss Albino rats (225–260gms) were obtained from the animal house of Department of Zoology, Faculty of Science, J.N.V. University, Jodhpur, Rajasthan India. The animals were kept at surrounding temperature (22±1°C), appropriate moisture (55±5%), 12 hours light and 12 hours dark cycle. All animals used for experimentation were maintained on a standard pellet diet and tap water in laboratory conditions in clean polypropylene cages, in groups of 6 animals each. The cages for bedding materials were changed from time to time. The animals (rats) were acclimated with laboratory environment for One-week. Animals had free access to drinking water and standard pellet diet ad libitum, all animals were fasted 3-4 h before dosage. Animal experiments were conducted prior approval of Institutional Animal Ethics Committee (IAEC) as per the control of the, Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), Ministry of Social Justice and Empowerment, Government of India. The proposal of the experimentation was permitted by the Institutional Animal Ethical Committee (IAEC) vide its proposal no. 9/BNCP/IAEC/2024 on Dated 01/08/2024.

Plant's Material Collection and Authentication

The fresh plant's material was collected from geographical locations Kaylana Lake across the Hills of Sursagar, Jodhpur regions of Rajasthan State during the optimal harvesting season (March-April 2023). The collected plant *Dipcadi erythraeum* was verified with the help of type specimen existing in the Herbarium of Botanical Survey of India, Jodhpur, Rajasthan (India). The plants were identified or authenticated by Dr. S. L. Meena (Scientist- E, Head of office at Botanical Survey of India) vide their voucher no. BSI /AZRC / 1.12012/ Tech/ 2023-24/ (Pl. Id.) /489 on dated 31-10-2023 as shown in (Figure1)

Figure 1. *Dipcadi erythraeum's* plant

Extraction and Phytochemical Analysis
Hydroalcoholic (90% Methanol: 10% water) extraction was performed using Soxhalation apparatus. The crude extracts were subjected to detailed phytochemical screening following standard protocols. (Figure 2)

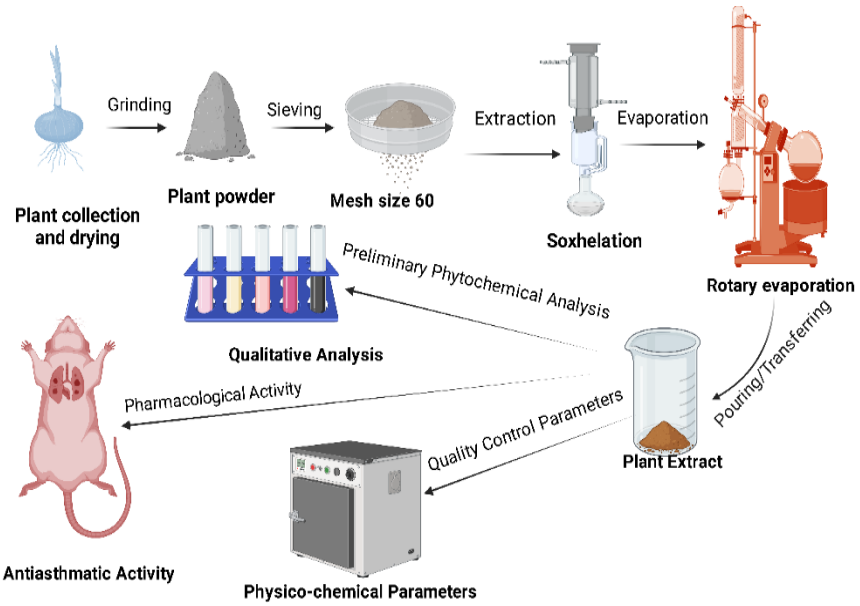

Figure 2. Scientific Investigation Workflow of *Dipcadi erythraeum*

Treatment
Hydroalcoholic extracts of the drug *Dipcadi erythraeum* was processed as mentioned above. Sufficient amounts (400mg/kg of bodyweight) of the extract were dissolved in water and administered for experimental evaluation.

Pharmacological Activities
Antiasthmatic Activity
The assessment utilized Inhibition of Leukocytes count in Rats as experimental models including:
Induction of Leukocytosis (Antiasthmatic Model) in Rats
The albino rats of either male or female sexes, weighing from 225–260 gms were designated and randomly divided into four groups, each group containing six numbers animals. Animal's group - I was named as Normal Group, administered 10 mL/kg (p.o.) of distilled water. Animals Groups- II was named as Induced Group, Group- III was named as Standard Group and Group- IV was named as Test Group were injected boiled and cooled milk at a dosage of 4 mL/kg, (s. c.). Animals of Group III were act as standard, administered dexamethasone drug at a dosage of 50 mg/kg, (i.p.). Animals of Group IV were act as test group and administered a corresponding amount of hydro-ethanolic extract of ***Dipcadi erythraeum*** and after 1 hour, boiled and cooled milk (4 mL/kg, s.c.) was administered to the similar animals. Blood's samples from Tail Vein were collected before and after treatment. Total leukocytes count (TLCs) were measured in each group before drug administration and 24 hours after milk and drug administration. The change in total leukocyte counts prior and 24 hours after test drug treatment was estimated.

Statistical analysis
Statistical analysis was performed to evaluate the significance of the experimental data. This involved applying statistical tests to determine if observed differences between groups were significant or due to random variation. Methods such as ANOVA followed by Dunnett's test were used to analyse the data and interpret the results.

Antipyretic Activity Assessment
Brewer's Yeast-Induced Fever Model in Albino Rats
Brewer's yeast caused fever model was employed using adult Wistar rats. Rats were separated into 4 groups (n=6 each). Animals Group-I was named as Normal Group, administered 10 mL/kg (p.o.) of distilled water. Animals Groups -II was named as Induced Group, Group- III was named as Standard Group and Group- IV was named as Test Group were injected Brewer's yeast (20% suspension, 10 mL/kg s.c.). Animals of Group III were act as standard and administered Paracetamol, 150 mg/kg, (i.p.). Animals of Group IV were act as test group and injected a respective amount of hydro-ethanolic extract of ***Dipcadi erythraeum*** and after 1 h Brewer's yeast (20% suspension, 10 mL/kg s.c.) was administered to the same animals. Body (Rectal) temperature measurements were recorded at regular intervals using digital thermal probes.

Statistical Analysis

- All investigational data were represented as mean ± SEM, (Standard Error of Mean). Statistical analysis was achieved using one-way ANOVA to compare group differences. The p-value < 0.05, was taken into considered as statistically significant.
- $p < 0.01$, considering as highly significant
- $p < 0.001$, considered as very highly significant.

RESULT

The hydroalcoholic extract of Dipcadi erythraeum was evaluated for antiasthmatic and antipyretic activities using validated experimental models in rats. The findings demonstrated significant pharmacological activity in both models.

1. **Antiasthmatic Activity**

Effect on Total Leukocyte Count (TLC)

The antiasthmatic activity of Dipcadi erythraeum extract was evaluated using a milk-induced leukocytosis model in rats. The induced control group showed a marked increase in total leukocyte count, confirming successful induction of leukocytosis. Treatment with the hydroalcoholic extract of Dipcadi erythraeum (400 mg/kg) produced a significant reduction in leukocyte count when compared with the induced group. The activity observed in the test group was comparable to the standard drug dexamethasone. The effect of Dipcadi erythraeum on total leukocyte count is presented in (Table 1), (Table 2)

Table 1. Effect of Dipcadi erythraeum extract on total leukocyte count in rats.

Group	Average Before	Mean Before (± SD)	Average After	Mean After (± SD)	Difference in Leukocyte Count (cells/mm³)	% Inhibition vs Induced	p-value (Paired t-test) vs Induced
Group 1 (Normal)	6525	6525±236	6526.667	6526±187	1.67 ± 55.70	_	_
Group 2 (Induced)	6641.667	6642±238	13508.33	13508±139	6866.67 ± 121.56	_	_
Group 3 (Standard)	6458.333	6458±196	9716.667	9717±225	3258.33 ± 159.38***	52.54%	p< 0.0001
Group 4 (D. erythraeum)	6591.66666	6592 ± 227	9970	9970± 166	3378.33 ± 115.2***	50.78%	p< 0.0001

Data are expressed as Mean±SEM Where n=6. (NS = Not Significant, $p < 0.05$ = Significant, $p < 0.001$ = Highly Significant).

Table 2. Dunnett's Test (p-Values)

Comparison	p-value	Significance
Induced vs Normal	1.90×10^{-13}	***
Induced vs Standard	5.99×10^{-9}	***
Induced vs Test	1.44×10^{-9}	***

Statistical analysis was done where *p < 0.05, **p < 0.01, ***p < 0.001 vs Control group (One-way ANOVA followed by Dunnett's Test).

Graphical Representation: The graphical representation further demonstrated that the leukocyte count in the induced group was significantly higher than the normal group, whereas treatment with Dipcadi erythraeum extract markedly reduced leukocyte levels. The reduction observed in the test group supports the antiasthmatic potential of the plant extract.

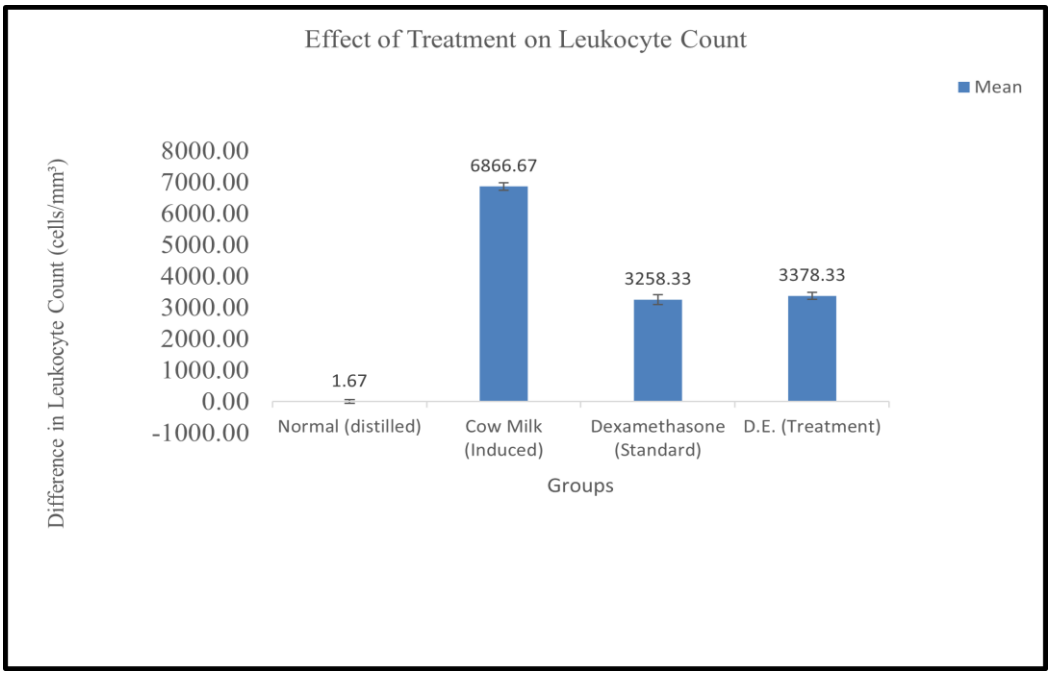

Figure 3. Graphical Representation of Effects of Treatments on Leukocyte Counts (D. erythraeum)

2. Antipyretic Activity

Effect on Rectal Temperature in Rats

The antipyretic activity of Dipcadi erythraeum (400 mg/kg) extract was evaluated using Brewer's yeast-induced pyrexia in rats. The induced control group showed a significant increase in rectal temperature compared with the normal group, confirming successful induction of pyrexia.

Administration of the plant D. erythraeum's extract exhibited a gradual reduction in rectal temperature over 6 hours. The antipyretic effect of the plant D. erythraeum's extract was found to be significant and comparable to the standard drug paracetamol (150 mg/kg) as shown in (Table 3 and 4).

Table 3. Effect of Dipcadi erythraeum Extract on Rectal Temperature in Yeast-Induced Pyrexia in Rats (Mean ± SEM)

Time (hrs)	Normal (°C) (Mean ± SEM) (n = 6)	Fever Induced (°C) (Mean ± SEM) (n = 6)	Standard (Paracetamol) (°C) (150 mg/kg) (Mean ± SEM) (n = 6)	Test (*Dipcadi erythraeum)* (400 mg/kg) (°C) (Mean ± SEM) (n = 6)
0 hr	37.15 ± 0.06	39.62 ± 0.05	38.10 ± 0.04***	38.18 ± 0.08 ***
1 hr	37.00 ± 0.04	39.70 ± 0.04	37.98 ± 0.03***	38.05 ± 0.05 ***
2 hr	36.95 ± 0.04	39.53 ± 0.04	37.85 ± 0.02***	38.00 ± 0.06 ***
4 hr	36.92 ± 0.05	39.48 ± 0.03	37.70 ± 0.03***	37.78 ± 0.08 ***
6 hr	36.87 ± 0.04	39.43 ± 0.03	37.58 ± 0.03***	37.68 ± 0.08 ***

Data are presented as Mean ± SEM (n = 6). ***p < 0.001 compared to Control group (Tukey's post hoc test following one-way ANOVA).

The induced group kept a raised rectal temperature throughout the observation period, indicating sustained fever. The standard group (treated with paracetamol) showed a significant reduction in temperature from 1 hour onward. The test group treated with plant extract (400 mg/kg) also demonstrated a significant antipyretic effect, comparable to the standard drug. All treatment values were significantly lower than control ($p < 0.001$), as indicated by asterisks as shown in (Table 4).

Table 4. One-Way ANOVA Analysis of Rectal Temperatures Between Groups

Time (h)	F-value	p-value
0	535.96	2.88×10^{-19}
1	1218.92	8.37×10^{-23}
2	962.33	8.76×10^{-22}
4	967.57	8.30×10^{-22}
6	995.12	6.28×10^{-22}

ne-way ANOVA analysis revealed statistically significant differences among the groups at each time point ($p < 0.001$). This suggests that both the standard drug and the test extract produced significant antipyretic effects compared to the untreated control group.

Graphical Representation

The effect of Dipcadi erythraeum Extract on Rectal Temperature in Yeast-Induced Pyrexia in Rats is represented in (Figure 4). The graphical representation further illustrates the progressive decline in rectal temperature in both the standard and test groups. The test extract's antipyretic effect closely followed that of paracetamol, particularly from 2 hours onward.

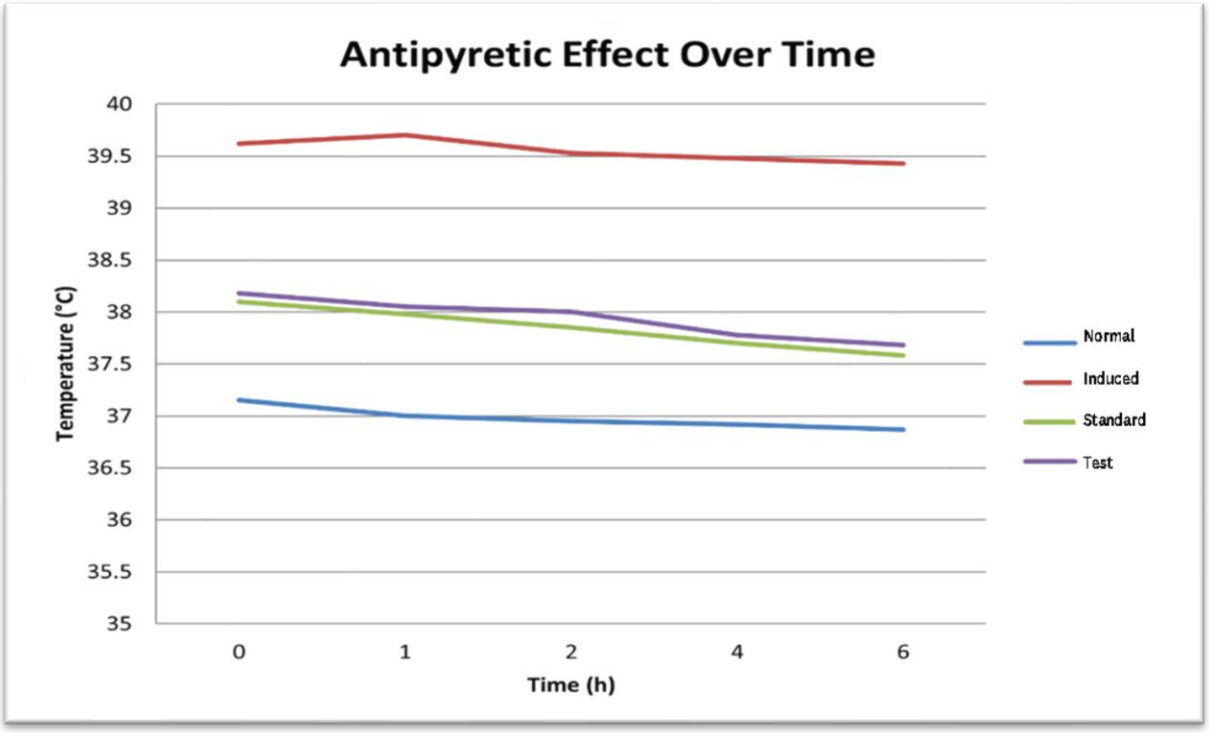

Figure 4. Effect of Dipcadi erythraeum Extract (400 mg/kg) on Brewer's Yeast-Induced Pyrexia in Rats over 6 Hours

DISCUSSION

The findings of the present investigation demonstrated that the hydroalcoholic extract of Dipcadi erythraeum (400mg/kg extract) possesses significant antiasthmatic and antipyretic activities.

Antiasthmatic Activity: Asthma is characterized by persistent airway inflammation, leading to bronchoconstriction and increased leukocyte infiltration in lung tissues. Leukocytosis (elevated leukocyte count) is a key marker of asthma severity, as it reflects immune activation and airway inflammation. Reduction in leukocyte count in the leukocytosis model suggests suppression of inflammatory mediators associated with airway inflammation and bronchial hypersensitivity.

- The test group (Dipcadi erythraeum, 400 mg/kg extract) significantly lowered leukocytes levels, indicating an anti-inflammatory action.

- The reduction in leukocytosis suggests that Dipcadi erythraeum may have potential bronchodilator or anti-inflammatory properties, supporting its traditional practice in respiratory illnesses.

Antipyretic Activity: Fever is a regulated biological response activated by infection, inflammation, or external stimuli, leading to increased body temperature due to the release of pyrogenic cytokines.

The antipyretic activity observed in the Brewer's yeast-induced pyrexia model may be attributed to inhibition of prostaglandin synthesis and modulation of inflammatory cytokines. The pharmacological effects may be associated with bioactive phytoconstituents such as flavonoids, alkaloids, and saponins.

- The statistical analysis confirmed that the reduction in temperature was highly significant ($p < 0.001$), supporting the antipyretic potential of Dipcadi erythraeum.

The results obtained in this study support the traditional medicinal use of Dipcadi erythraeum in the management of respiratory disorders and fever. However, further studies are required to isolate active constituents and evaluate detailed molecular mechanisms.

Comparison with Existing Literature

Several medicinal plants have demonstrated antipyretic and anti-asthmatic effects, but limited studies have been conducted on Dipcadi erythraeum.

Similar results have been reported for other flavonoid-rich plants, which inhibit pyrogen-induced fever by modulating prostaglandin synthesis.

Previous studies on herbal extracts with anti-inflammatory and bronchodilator effects support the findings of this study, suggesting that Dipcadi erythraeum may be beneficial for respiratory conditions

CONCLUSION

The present study demonstrated that the hydroalcoholic extract of Dipcadi erythraeum exhibits significant antiasthmatic and antipyretic activities in experimental rat models. The extract effectively reduced leukocyte count and rectal temperature, supporting its therapeutic potential.

The findings provide scientific evidence for the traditional use of the plant in respiratory disorders and pyrexia.

Future studies should focus on: Upcoming investigation should emphasis on isolating the bioactive constituents responsible for these properties, conducting mechanistic studies on their molecular targets, and carrying out clinical trials to evaluate the therapeutic value of Dipcadi erythraeum in humans. Furthermore, development of formulation and pharmacokinetic study should be discovered to improve its curative applicability. This study offers scientific proof for the traditional usage of Dipcadi erythraeum in fever and respiratory disorders, focusing its potential as a natural substitute to synthetic antipyretics and anti-asthmatic medicines.

Conflict Of Interest: The authors have no conflicts of interest regarding this investigation.

Acknowledgments: The authors would like to thank Bhupal Nobles University, Udaipur, Rajasthan and Jai Narain Vyas University, Jodhpur, Rajasthan for their kind support during research work and animal study

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