Research Paper

INVESTIGATION OF ANTIPYRETIC POTENTIAL OF ZYGOPHYLLUM ARABICUM WHOLE PLANT EXTRACT AGAINST DIFFERENT PYREXIA MODELS IN RATS

Govind Ram, Deepak Mishra*
Department of Biotechnology, AKS University, Satna, M.P., India
***Corresponding Author: Deepak Mishra | Email: deepakrewabiotech@gmail.com**

ABSTRACT
The present study was undertaken to evaluate the antipyretic and antioxidant activity of the methanolic whole plant extract of Zygophyllum arabicum against experimentally induced pyrexia in rats. The whole plant material was shade dried, powdered, defatted with petroleum ether, and extracted with methanol using the maceration method. The obtained extract was subjected to pharmacological evaluation using yeast-induced, lipopolysaccharide (LPS)-induced, and turpentine-induced pyrexia models in rats. The antipyretic activity was assessed by measuring rectal temperature at different time intervals following induction of fever. Biochemical estimations including Tumor Necrosis Factor-alpha (TNF-α), Interleukin-1 beta (IL-1β), Prostaglandin E2 (PGE2), Cyclooxygenase-2 (COX-2), Malondialdehyde (MDA), Superoxide Dismutase (SOD), Catalase (CAT), and Glutathione (GSH) were also evaluated to investigate the anti-inflammatory and antioxidant effects of the extract. Paracetamol (150 mg/kg) was used as the standard drug, while the plant extract was administered at doses of 100 mg/kg and 200 mg/kg body weight. The results demonstrated that the methanolic extract significantly reduced elevated body temperature in all pyrexia models in a dose-dependent manner. The extract also markedly decreased the levels of pro-inflammatory mediators such as TNF-α, IL-1β, PGE2, COX-2, and MDA, while significantly restoring antioxidant enzyme levels including SOD, CAT, and GSH. The higher dose (200 mg/kg) exhibited better pharmacological activity and showed effects comparable to the standard drug paracetamol. The findings of the study suggest that the methanolic whole plant extract of Zygophyllum arabicum possesses significant antipyretic, anti-inflammatory, and antioxidant activities, thereby supporting its traditional medicinal use in the treatment of fever and inflammatory disorders.

Keywords: Zygophyllum arabicum; Antipyretic activity; Yeast-induced pyrexia; Lipopolysaccharide-induced pyrexia; Turpentine-induced pyrexia; Methanolic extract.
How to cite this article: Ram G, Mishra D. Investigation of Antipyretic Potential of Zygophyllum arabicum Whole Plant Extract Against Different Pyrexia Models in Rats. Int J Drug Deliv Technol. 2026;16(55s): 929-935. DOI: 10.25258/ijddt.16.55s.93
Source of support: Nil.
Conflict of interest: None.

Introduction

Fever or pyrexia is one of the most common clinical manifestations associated with infection, inflammation, tissue injury, and various pathological conditions. It is characterized by an abnormal elevation in body temperature resulting from a disturbance in the thermoregulatory center located in the hypothalamus (El-Radhi et al., 2019).

Pyrexia generally occurs due to the release of endogenous pyrogens such as interleukins, tumor necrosis factor-alpha (TNF-α), and interferons, which stimulate the synthesis of prostaglandin E2 (PGE2) in the hypothalamus, leading to an increase in body temperature. Although fever serves as a defensive mechanism against microbial invasion, prolonged or excessive fever may produce harmful physiological effects and therefore requires therapeutic intervention (El-Radhi et al., 2019).

Conventional antipyretic drugs such as paracetamol and non-steroidal anti-inflammatory drugs (NSAIDs) are commonly used for the management of fever. These agents exert their antipyretic action mainly through inhibition of cyclooxygenase enzymes and suppression of prostaglandin synthesis (Fokunang et al., 2018). However, prolonged use of synthetic antipyretic drugs may lead to adverse effects including gastric irritation, hepatotoxicity, nephrotoxicity, and hypersensitivity reactions. These limitations have stimulated increasing interest in the search for safer and more effective antipyretic agents from natural sources (Simmons et al., 2000).

Medicinal plants have been used traditionally for centuries in the treatment of fever and inflammatory disorders due to their rich content of bioactive phytoconstituents such as flavonoids, alkaloids, tannins, saponins, phenolic compounds, and terpenoids. Many plant-derived compounds possess significant antipyretic, anti-inflammatory, and antioxidant properties with comparatively fewer side effects than synthetic drugs. Therefore, scientific validation of traditional medicinal plants has become an important area of pharmaceutical and biomedical research (Akkol et al., 2012; Tarkang et al., 2015).

Zygophyllum arabicum is an important medicinal plant belonging to the family Zygophyllaceae and is

traditionally used in folk medicine for the treatment of fever, inflammation, pain, and various other ailments. The plant is reported to contain several pharmacologically active constituents including flavonoids, phenolic compounds, alkaloids, and glycosides, which may contribute to its therapeutic potential. Despite its traditional importance, limited scientific studies are available regarding its antipyretic activity and underlying mechanisms of action (El Ansari et al., 2025).

Inflammation and oxidative stress are closely associated with the pathogenesis of fever. During pyrexia, excessive production of inflammatory mediators such as TNF-α, Interleukin-1 beta (IL-1β), cyclooxygenase-2 (COX-2), and prostaglandins leads to elevation of body temperature (Mosili et al., 2020). Simultaneously, increased oxidative stress results in lipid peroxidation and depletion of endogenous antioxidant defense systems such as superoxide dismutase (SOD), catalase (CAT), and glutathione (GSH). Hence, evaluation of both inflammatory and oxidative stress biomarkers is important for understanding the therapeutic potential of medicinal plant extracts in pyrexia (Mota-Rojas et al., 2021).

The present study was therefore designed to investigate the antipyretic potential of the methanolic whole plant extract of *Zygophyllum arabicum* against different experimentally induced pyrexia models in rats, including yeast-induced, lipopolysaccharide (LPS)-induced, and turpentine-induced pyrexia. The study also aimed to evaluate the effect of the extract on inflammatory mediators and antioxidant parameters to elucidate its possible mechanism of action. The findings of this investigation may provide scientific evidence supporting the traditional use of *Zygophyllum arabicum* in the treatment of fever and inflammatory disorders.

Material and Methods

Material

The whole plant of Zygophyllum arabicum was collected, shade dried, and powdered for extraction. Petroleum ether was used for defatting of the plant material, while methanol was used as the extraction solvent for preparation of the crude extract by the maceration method. Brewer's yeast, lipopolysaccharide (LPS), and turpentine oil were used for induction of pyrexia in experimental animals. Paracetamol was used as the standard antipyretic drug. Analytical grade chemicals and reagents including buffers and biochemical assay kits for estimation of TNF-α, IL-1β, PGE2, COX-2, MDA, SOD, CAT, and GSH were used throughout the study. Adult Wistar rats were used for evaluation of antipyretic activity.

Methods

Extraction Procedure

The following procedure was adopted for the preparation of extract from the shade-dried and powdered whole plant material of *Zygophyllum arabicum* according to the method reported by Khandelwal (2005).

Defatting of Plant Material

Approximately 47 g of shade-dried and coarsely powdered whole plant material of *Zygophyllum arabicum* was subjected to defatting with petroleum ether by the maceration method. The process was continued until complete removal of fatty and non-polar impurities from the plant material was achieved.

Extraction by Maceration Method

The defatted plant material was subsequently extracted with methanol, using the maceration method. The extraction process was carried out for a sufficient period with intermittent shaking to ensure maximum extraction of phytoconstituents. The obtained extracts were filtered through Whatman filter paper No. 1 and the filtrates were concentrated by evaporating the respective solvents to obtain dried crude extracts. The dried extracts were weighed to determine the percentage extractive yield and then transferred into clean glass vials (6 × 2 cm). The extracts were stored in a refrigerator at 4°C until further analysis, as described by Mukherjee (2007).

In vivo antipyretic activity

Animals

The central animal facility provided wistar rats of both sexes that weighed between 150 and 200 grams and were between two and three months old. The animals were kept under conventional settings, which included a 12-hour light/dark cycle and a temperature of 25±1°C.

The Institutional Animal Ethics Committee authorized the study designs, and all experimental techniques followed the criteria of the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA).

Acute toxicity study

Studies on acute oral toxicity were carried out in compliance with the Organization for Economic Co-operation and Development's (OECD) updated draft guideline 423 (Guidance, 2001). *Zygophyllum arabicum* plant extract was made, and albino rats were given an oral dose of 2000 mg/kg of all plant extracts. Each dose was first given to four more rats after being tested on one rat. Monitoring continued for up to 14 days after administration, with observations made during the first four hours to monitor changes in skin and fur, eyes, mucous membranes, hyperactivity, grooming, convulsions, sedation, hypothermia, tremors, salivation, coma, lethargy, body weight, and mortality. The effective therapeutic doses were determined to be one-tenth

and half of the lethal dose; threshold values of 100 mg/kg and 200 mg/kg were used to analyze the dose-dependent effects in evaluating anti-arthritic activity (Liu *et al.,* 2017).

Experimental

The animals' body weights were noted, and they were split into five groups of six animals each at random:

Group I served as normal

Group II served as control- chemically induced pyrexia was administered to the animals.

Group III animals were given the usual dosage of paracetamol (150 mg/kg b.w.) and chemically induced pyrexia.

Group IV animals were given *Zygophyllum arabicum* whole plant extract (100 mg/kg/p.o.) and chemically induced pyrexia.

Group V animals were given *Zygophyllum arabicum* whole plant extract (200 mg/kg/p.o.) and chemically induced pyrexia.

Brewer's yeast-induced pyrexia

A rectal thermometer was carried out to record the initial rectal temperature of the rats' rectum down to a depth of 1.5 cm. The study comprised animals whose body temperatures ranged from 36 to 38°C. After that, a subcutaneous injection of 10% Brewer's yeast in 0.9% w/v saline was administered beneath the nape of the neck at a rate of 10 ml/kg. To guarantee that the suspension spread beneath the skin, the injection site was massaged. The temperature of the room was kept between 22 and 24°C. Food was taken out right away after the yeast infusion. The increase in rectal temperature was noted 10 hours after the challenge. A minimum of six rats per group were allowed to participate in the study if their body temperature increased to at least 39°C. The rectal temperature was measured at 2, 4, 6, 12, and 24 hours after the animals were given either the test chemical or the standard (paracetamol 100 mg/kg) orally. It was determined and compared to the control hyperpyrexia group how much the average rectal temperature may decrease.

Statistical analysis

GraphPad Instant 3.06 software version 14 for Windows XP (Microsoft Corporation) was used to insert variables of interest and analyze all data. The mean ± standard error of the mean (SEM) is used to express all statistical analyses. One-way ANOVA was used to examine the data, and Tukey's post hoc test was used when appropriate. *$p<0.05$, **$p<0.01$, and ***$p<0.001$ were deemed statistically significant when compared to the vehicle.

Results and Discussion

The present study evaluated the antipyretic activity of the methanolic whole plant extract of Zygophyllum arabicum against different experimentally induced pyrexia models in rats, including yeast-induced, lipopolysaccharide (LPS)-induced, and turpentine-induced pyrexia. The findings demonstrated that the extract possessed significant dose-dependent antipyretic, anti-inflammatory, and antioxidant activities.

In the yeast-induced pyrexia model, rectal temperature was markedly elevated in the pyretic control group after administration of brewer's yeast, indicating successful induction of fever. Treatment with the methanolic extract significantly reduced rectal temperature compared to the control group, particularly at the dose of 200 mg/kg body weight. As shown in Table 1, the higher dose exhibited a greater reduction in elevated body temperature, comparable to the standard drug paracetamol. The reduction in temperature suggests inhibition of pyrogen-mediated prostaglandin synthesis within the hypothalamus.

The levels of inflammatory cytokines such as Tumor Necrosis Factor-alpha (TNF-α) and Interleukin-1 beta (IL-1β) were significantly increased in the pyretic control animals. Administration of the extract markedly reduced these cytokines in a dose-dependent manner, as presented in Table 2 and Table 3. The decrease in TNF-α and IL-1β levels indicates suppression of pro-inflammatory mediators responsible for fever generation and inflammatory responses.

Similarly, Prostaglandin E2 (PGE2), a major mediator involved in pyrexia, was significantly elevated in the disease control group and effectively reduced following treatment with the plant extract (Table 4). The inhibitory effect on PGE2 synthesis may be associated with suppression of cyclooxygenase activity. This observation was further supported by the reduction in Cyclooxygenase-2 (COX-2) levels shown in Table 5. The results suggest that the extract may exert antipyretic activity through inhibition of COX-2-mediated prostaglandin biosynthesis.

Oxidative stress markers were also evaluated to investigate the antioxidant potential of the extract. Malondialdehyde (MDA), an indicator of lipid peroxidation, was significantly elevated in pyretic animals, while treatment with the extract reduced MDA levels considerably, as shown in Table 6. The reduction in lipid peroxidation indicates protective effects against oxidative damage induced during pyrexia.

The antioxidant enzyme activities of Superoxide Dismutase (SOD), Catalase (CAT), and Glutathione (GSH) were markedly decreased in pyretic control animals. Treatment with the methanolic extract significantly restored these antioxidant defense parameters toward normal levels in a dose-dependent manner (Table 7, Table 8, and Table 9). The

improvement in antioxidant status suggests that the plant extract possesses strong free radical scavenging activity and may protect tissues from oxidative stress-associated cellular injury.

The antipyretic activity of the extract was further confirmed using LPS-induced and turpentine-induced pyrexia models. In both experimental models, administration of the extract significantly reduced elevated rectal temperature compared to pyretic controls, as shown in Table 10 and Table 11. The higher dose (200 mg/kg) demonstrated better antipyretic activity than the lower dose, approaching the effect of the standard drug. These findings confirm the broad-spectrum antipyretic potential of the methanolic extract against different pyrogenic stimuli.

The observed pharmacological activities may be attributed to the presence of bioactive phytoconstituents such as flavonoids, alkaloids, tannins, phenolic compounds, and saponins present in the methanolic extract of *Zygophyllum arabicum*. These phytochemicals are known to possess anti-inflammatory, antioxidant, and cyclooxygenase inhibitory properties, which collectively contribute to the reduction of fever and inflammatory mediators.

The results of the present investigation suggest that the methanolic whole plant extract of Zygophyllum arabicum possesses significant antipyretic and antioxidant activities in experimentally induced pyrexia models. The study scientifically supports the traditional use of the plant in the management of fever and inflammatory conditions.

Table 1: Antipyretic activity of the whole plant extract of *Zygophyllum arabicum* against yeast-induced pyrexia in rats

Group	Rectal Temperature °C					
	0 hr	2 hrs	4 hrs	6 hrs	12 hrs	24 hrs
Group I	37.0 ± 0.11	37.1 ± 0.10	37.0 ± 0.10	36.9 ± 0.09	36.8 ± 0.08	36.9 ± 0.08
Group II	37.1 ± 0.12	38.9 ± 0.14	39.5 ± 0.16	39.1 ± 0.15	38.2 ± 0.13	37.5 ± 0.12
Group III	37.0 ± 0.10	38.6 ± 0.13	37.5 ± 0.12	37.1 ± 0.10	36.7 ± 0.09	36.5 ± 0.08
Group IV	37.1 ± 0.11	38.4 ± 0.12	37.9 ± 0.11	37.5 ± 0.10	37.1 ± 0.09	37.0 ± 0.08
Group V	37.0 ± 0.10	38.3 ± 0.12	37.7 ± 0.10	37.2 ± 0.09	36.9 ± 0.08	36.8 ± 0.07

*Values expressed as mean ± SEM (n=6) *P<0.05 as compared to pyretic control*

Table 2: Antipyretic activity of the whole plant extract of *Zygophyllum arabicum* against yeast-induced pyrexia in rats on Tumor Necrosis Factor-alpha (TNF-α)

Group	Treatment	Tumor Necrosis Factor-alpha (TNF-α, pg/mL)
Group I	Normal	42.5 ± 2.8
Group II	Control- animals were treated with chemical-induced pyrexia.	118.6 ± 4.5
Group III	Yeast-induced pyrexia and the standard paracetamol (150mg/kg b.w.).	58.7 ± 3.2
Group IV	Yeast-induced pyrexia and the whole plant extract of *Zygophyllum arabicum* (100 mg/kg/p.o.).	74.3 ± 3.8
Group V	Yeast-induced pyrexia and the whole plant extract of *Zygophyllum arabicum* (200 mg/kg/p.o.).	60.5 ± 3.4

Table 3: Antipyretic activity of the whole plant extract of *Zygophyllum arabicum* against yeast-induced pyrexia in rats on Interleukin-1 beta (IL-1β)

Group	Treatment	Interleukin-1 beta (IL-1β, pg/mL)
Group I	Normal	12.4 ± 1.2
Group II	Control- animals were treated with chemical-induced pyrexia.	62.8 ± 3.6
Group III	Yeast-induced pyrexia and the standard paracetamol (150mg/kg b.w.).	19.5 ± 1.8
Group IV	Yeast-induced pyrexia and the whole plant extract of *Zygophyllum arabicum* (100 mg/kg/p.o.).	35.7 ± 2.4

Group V	Yeast-induced pyrexia and the whole plant extract of *Zygophyllum arabicum* (200 mg/kg/p.o.).	22.8 ± 2.0

Table 4: Antipyretic activity of the whole plant extract of *Zygophyllum arabicum* against yeast-induced pyrexia in rats on Prostaglandin E2 (PGE2)

Group	Treatment	Prostaglandin E2 (PGE2, pg/mL)
Group I	Normal	85.6 ± 3.8
Group II	Control- animals were treated with chemical-induced pyrexia.	246.3 ± 6.5
Group III	Yeast-induced pyrexia and the standard paracetamol (150mg/kg b.w.).	108.4 ± 4.1
Group IV	Yeast-induced pyrexia and the whole plant extract of *Zygophyllum arabicum* (100 mg/kg/p.o.).	152.7 ± 4.6
Group V	Yeast-induced pyrexia and the whole plant extract of *Zygophyllum arabicum* (200 mg/kg/p.o.).	118.9 ± 4.3

Table 5: Antipyretic activity of the whole plant extract of *Zygophyllum arabicum* against yeast-induced pyrexia in rats on Cyclooxygenase-2 (COX-2)

Group	Treatment	Cyclooxygenase-2 (COX-2, pg/mL)
Group I	Normal	1.05 ± 0.08
Group II	Control- animals were treated with chemical-induced pyrexia.	4.28 ± 0.22
Group III	Yeast-induced pyrexia and the standard paracetamol (150mg/kg b.w.).	1.42 ± 0.11
Group IV	Yeast-induced pyrexia and the whole plant extract of *Zygophyllum arabicum* (100 mg/kg/p.o.).	2.91 ± 0.16
Group V	Yeast-induced pyrexia and the whole plant extract of *Zygophyllum arabicum* (200 mg/kg/p.o.).	1.68 ± 0.12

Table 6: Antipyretic activity of the whole plant extract of *Zygophyllum arabicum* against yeast-induced pyrexia in rats on Malondialdehyde (MDA)

Group	Treatment	Malondialdehyde (MDA, nmol/mg)
Group I	Normal	1.18 ± 0.06
Group II	Control- animals were treated with chemical-induced pyrexia.	3.95 ± 0.12
Group III	Yeast-induced pyrexia and the standard paracetamol (150mg/kg b.w.).	1.45 ± 0.07
Group IV	Yeast-induced pyrexia and the whole plant extract of *Zygophyllum arabicum* (100 mg/kg/p.o.).	2.65 ± 0.09
Group V	Yeast-induced pyrexia and the whole plant extract of *Zygophyllum arabicum* (200 mg/kg/p.o.).	1.72 ± 0.08

Table 7: Antipyretic activity of the whole plant extract of *Zygophyllum arabicum* against yeast-induced pyrexia in rats on Superoxide Dismutase (SOD)

Group	Treatment	Superoxide Dismutase (SOD, U/mg)
Group I	Normal	27.8 ± 1.4
Group II	Control- animals were treated with chemical-induced pyrexia.	8.2 ± 0.9

Group III	Yeast-induced pyrexia and the standard paracetamol (150mg/kg b.w.).	25.8 ± 1.3
Group IV	Yeast-induced pyrexia and the whole plant extract of *Zygophyllum arabicum* (100 mg/kg/p.o.).	18.6 ± 1.2
Group V	Yeast-induced pyrexia and the whole plant extract of *Zygophyllum arabicum* (200 mg/kg/p.o.).	23 ± 1.4

Table 8: Antipyretic activity of the whole plant extract of *Zygophyllum arabicum* against yeast-induced pyrexia in rats on Catalase (CAT)

Group	Treatment	Catalase (CAT, U/mg)
Group I	Normal	42.5 ± 2.1
Group II	Control- animals were treated with chemical-induced pyrexia.	15.8 ± 1.2
Group III	Yeast-induced pyrexia and the standard paracetamol (150mg/kg b.w.).	38.2 ± 2.0
Group IV	Yeast-induced pyrexia and the whole plant extract of *Zygophyllum arabicum* (100 mg/kg/p.o.).	28.7 ± 1.8
Group V	Yeast-induced pyrexia and the whole plant extract of *Zygophyllum arabicum* (200 mg/kg/p.o.).	37.1 ± 2.0

Table 9: Antipyretic activity of the whole plant extract of *Zygophyllum arabicum* against yeast-induced pyrexia in rats on Glutathione (GSH)

Group	Treatment	Glutathione (GSH, µmol/mg)
Group I	Normal	9.6 ± 0.5
Group II	Control- animals were treated with chemical-induced pyrexia.	2.8 ± 0.3
Group III	Yeast-induced pyrexia and the standard paracetamol (150mg/kg b.w.).	8.9 ± 0.4
Group IV	Yeast-induced pyrexia and the whole plant extract of *Zygophyllum arabicum* (100 mg/kg/p.o.).	6.2 ± 0.3
Group V	Yeast-induced pyrexia and the whole plant extract of *Zygophyllum arabicum* (200 mg/kg/p.o.).	8.0 ± 0.4

Table 10: Antipyretic activity of the whole plant extract of *Zygophyllum arabicum* against Lipopolysaccharide (LPS)-induced pyrexia in rats

Rectal Temperature in °C			
Group	**0 hr.**	**2 hrs.**	**4 hrs.**
Group I	37.0 ± 0.11	37.1 ± 0.10	37.0 ± 0.11
Group II	37.1 ± 0.12	39.5 ± 0.13	39.9 ± 0.15
Group III	37.0 ± 0.10	39.1 ± 0.11	37.8 ± 0.10
Group IV	37.0 ± 0.10	38.9 ± 0.11	38.1 ± 0.10
Group V	37.0 ± 0.10	38.7 ± 0.11	37.9 ± 0.10

Values expressed as mean ± SEM (n=6) *P<0.05as compared to pyretic control

Table 11: Antipyretic activity of the whole plant extract of *Zygophyllum arabicum* against Turpentine-induced pyrexia in rats

Rectal Temperature in °C			
Group	**0 hr.**	**2 hrs.**	**4 hrs.**
Group I	37.0 ± 0.10	37.1 ± 0.09	37.0 ± 0.10
Group II	37.1 ± 0.12	39.3 ± 0.14	39.8 ± 0.15
Group III	37.0 ± 0.11	39.1 ± 0.12	37.9 ± 0.11
Group IV	37.0 ± 0.10	38.9 ± 0.11	38.3 ± 0.10
Group V	37.0 ± 0.10	38.7 ± 0.11	38.1 ± 0.10

Values expressed as mean ± SEM (n=6) *P<0.05as compared to pyretic control

Conclusion

The present study demonstrated that the methanolic whole plant extract of Zygophyllum arabicum possesses significant antipyretic, anti-inflammatory, and antioxidant activities against experimentally induced pyrexia in rats. The extract effectively reduced elevated body temperature, suppressed inflammatory mediators, and improved antioxidant enzyme levels in a dose-dependent manner. The higher dose (200 mg/kg) showed activity comparable to the standard drug paracetamol. The findings scientifically support the traditional use of *Zygophyllum arabicum* in the treatment of fever and inflammatory disorders.

References

- El-Radhi AS. Fever in common infectious diseases. In: Clinical Manual of Fever in Children. Cham: Springer International Publishing; 2019. p. 85-140.
- El-Radhi AS. Pathogenesis of fever. In: Clinical Manual of Fever in Children. Cham: Springer International Publishing; 2019. p. 53-68.
- Fokunang C, Fokunang ET, Frederick K, Ngameni B, Ngadjui B. Overview of non-steroidal anti-inflammatory drugs (NSAIDs) in resource limited countries. MOJ Toxicol. 2018;4(1):5-13.
- Simmons DL, Wagner D, Westover K. Nonsteroidal anti-inflammatory drugs, acetaminophen, cyclooxygenase 2, and fever. Clin Infect Dis. 2000;31(Suppl 5):S211-S218.
- Akkol EK, Das S, Sarker SD, Nahar L. The treatment of inflammation, pain, and fever using medicinal plants. Adv Pharmacol Sci. 2012;2012:476985.
- Tarkang PA, Okalebo FA, Siminyu JD, Ngugi WN, Mwaura AM, Mugweru J, et al. Pharmacological evidence for the folk use of Nefang: antipyretic, anti-inflammatory and antinociceptive activities of its constituent plants. BMC Complement Altern Med. 2015;15(1):174.
- El Ansari M, Najem M, Ibijbijen J, Bouraada K, Nassiri L. Qualitative and quantitative ethnobotanical assessment of Zygophyllum gaetulum Emb. & Maire: An emblematic medicinal plant of Saharan heritage. Ethnobot Res Appl. 2025;32:1-21.
- Mosili P, Maikoo S, Mabandla MV, Qulu L. The pathogenesis of fever-induced febrile seizures and its current state. Neurosci Insights. 2020;15:2633105520956973.
- Mota-Rojas D, Wang D, Titto CG, Gómez-Prado J, Carvajal-De la Fuente V, Ghezzi M, et al. Pathophysiology of fever and application of infrared thermography (IRT) in the detection of sick domestic animals: Recent advances. Animals (Basel). 2021;11(8):2316.
- Khandelwal KR. Practical Pharmacognosy: Techniques and Experiments. 23rd ed. Pune: Nirali Prakashan; 2005. p. 15.
- Mukherjee PK. Quality Control of Herbal Drugs. 2nd ed. New Delhi: Business Horizons Pharmaceutical Publishers; 2007. p. 2-14.
- Liu XM, Islam MW, HB I. Evaluation of anti-inflammatory activity of Fagonia indica in rats. In: International Congress and 49th Annual Meeting of the Society for Medicinal Plant Research; 2001 Sep 2; 2001. p. 2-6.