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PHYTOCHEMICAL ANALYSIS AND ANALGESIC ACTIVITY OF THE EXTRACT OF *PROSOPIS JULIFLORA*

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ABSTRACT: Background: In dry and semi-arid regions of the world, *Prosopis juliflora* is one of the most significant tree species both commercially and environmentally. Leguminosae (Fabaceae) is the family to which *Prosopis juliflora* belongs. **Aims and Objectives:** To evaluate the analgesic activity of methanolic extract of dried leaves of *Prosopis juliflora* Linn. **Materials and Methods:** In this investigation, adult male Wistar rats weighing between 100 and 150 grams were utilized. *Prosopis juliflora* Linn. methanolic extract was given orally to healthy albino rats at dosages of 300 and 500 mg/kg body weight in order to assess the acute analgesic efficacy using the tail flick technique. **Result:** The methanolic extract demonstrated a substantial and dose-dependent reduction in the reaction time on tail-flick throughout the course of the 60 minutes in acute trials. Turkey's test was performed after one-way ANOVA was used for statistical analysis. **Conclusion:** Methanolic extract of *Prosopis juliflora* Linn. possesses analgesic activity in a dose-dependent manner in thermal induced model.

INTRODUCTION: Nature is always a perfect example of the remarkable phenomenon of symbiosis. Humans have historically utilized nature's remedies to preserve health and cure a wide range of illnesses. A fundamental product from natural resources including plant, animal, and mineral sources was utilized to cure human diseases [1]. The use of medicinal plants is crucial for maintaining both individual and community health.

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Medicinal plants are a possible source of medicinal assistance and have played a major part in global health systems for both humans and animals, not only in the case of sickness but also as a means of preserving good health [2]. Since, the beginning of human history, plants have been utilized by humans as a source of medicinal remedies. A success of popular therapeutic variety is herbal medicine [3].

The globe is currently shifting toward herbal remedies or systems, which may effectively combat foreign invaders and assist in eliminating harmful infections without having harmful side effects[4]. Early in the 1970s, the World Health Organization urged governments to make good use of indigenous knowledge of herbal remedies for the prevention of

illness and promotion of health [5]. The World Health Organization (WHO) has demonstrated a strong interest in recording the usage of medicinal plants by indigenous people worldwide [6]. There are still numerous kinds of plants in the kingdom of plants that may contain undiscovered therapeutic compounds. As everyone knows, one of the best places to get therapeutic herbs is India. Over the past twenty years, there has been a huge surge in interest in medicinal plants. From an academic perspective, it is clear that students studying pharmacology, phytochemistry, and botany now anticipate some in-depth research on therapeutic plants. Modern pharmacological testing methods and isolation techniques ensure that novel plant medications typically enter the medical field as pure compounds rather than as galenical mixtures.

With these novel medications, it is crucial that the pharmacist performs the chromatographic and other processes required for the identification and assessment of the preparation's purity, rather than just being completely knowledgeable about the macroscopically and histological features of the dried plant. The plants that have long been employed in Chinese and Indian traditional medicine are now the subject of extensive scientific study [7].

Any medication used to provide analgesia pain relief is referred to as an analgesic, or painkiller [8]. The central and peripheral nerve systems are affected in different ways by analgesic medications. They are not to be confused with anesthetics, which are substances that temporarily take away feeling. Examples of them include Acetaminophen, also known as paracetamol in the US, salicylates, and other non-steroidal anti-inflammatory medications (NSAIDs), as well as opioids like morphine and opium. A medication known as an analgesic is one that, without appreciably changing awareness, selectively reduces pain by acting on peripheral or central nervous system processes. Although pain is a warning indication and mainly protective in nature, it may also be excruciating and debilitating. Other side effects of excessive pain include sinking sensation, anxiety, sweating, nausea, palpitations, rise or fall in blood pressure, and tachypnea. Analgesics treat the symptom of pain without changing the underlying cause of it [9].

MATERIALS AND METHODS:

Plant Materials: *Prosopis juliflora* is one of the most economically and ecologically important tree species in arid and semi-arid zones of the world. *Prosopis juliflora* belongs to the family Leguminosae (Fabaceae), sub-family Mimosoideae, and it is having 44species of which 40 are native to the Americas, three to Asia and one to Africa. Six species are found in the tropical Andes, while eight species seven of which are endemic can be found in the Texas region. These plants have a variety of characteristics, including the capacity to thrive in the poorest soils and the ability to stabilize sand and bind soil. It is an 8–12-meter-long shrub or tree. *P. juliflora* may reach a height of up to 12 meters (39 feet) with a trunk diameter of up to 1.2 meters (3.9 feet).

Its deciduous, geminate-pinnate, light green leaves have anywhere from 12 to 20 leaflets. Shortly after leaf development, leaves appear. The tree doesn't use vegetative reproduction; it only uses seeds. Cattle and other animals disperse seeds by eating the seed pods and doing so in their droppings. The tree, now known as vanni-andara, or katuandara in Sinhala, is said to have been brought to Sri Lanka in the 19th century. *P. juliflora* is said to have existed and even been revered as a sacred tree in ancient India, although this is probably mistaken for *Prosopis cineraria*. The tree is said to have been there for a very long period in the Mannar and Vanni regions [10]. *Prosopis juliflora* easily hybridizes with *Prosopis pallida* in the western regions of its distribution in Ecuador and Peru, and it might be challenging to tell the two species apart from each other or from their interspecific hybrid strains [11].

Its many chemical constituents demonstrate its potential medical significance in modifying specific physiological processes inside the human body. The plant contains several biochemicals, including phenolic substances, flavonoids, alkaloids, and terpenes. Terpenes have pharmacological qualities that make them antibacterial, antifungal, anthelmintic, antimalarial, and molluscicidal. They are employed as insecticides [12]. *P. juliflora* seed and leaf extracts show a variety of in vitro pharmacological activities, including anti-inflammatory, anti-fungal, and anti-bacterial characteristics [13].

Because *P. juliflora* wood burns so well, it supplies more than 90% of the fuel wood in some Indian communities, where it is a major source of fuel for the nation's impoverished in both urban and rural areas. It is known as wooden anthracite as a result. Its calorific value is likewise high. This plant produces wood that doesn't require drying or storage [14].

Numerous alkaloids, including juliflorine, julifloridine, juliprosine, juliprosinine, and juliflorinine, are shown to be responsible for the biological activity of *Prosopis juliflora* (Sw.) DC.

Preparation of Plant Extract: Using a hot continuous extraction approach with a Soxhlet apparatus, we have obtained a methanolic extract of *Prosopis juliflora*. Crude plant extract may be easily prepared with a commercially available Soxhlet device. The medicine was packaged, dried, and potent.

The Soxhlet device is a continuous, automated process that doesn't need any further manipulation. This technique doesn't take a lot of time because it just takes 48 hours to extract a standard-sized sample (50 g). The aqueous extract had a yield of 9.52%. The extract was refrigerated until more research was conducted.

Drugs: Ibuprofen, Diclofenac sodium, Asprin (Cipla), acetic acid (ASES Chemical Works, Jodhpur), and Sodium chloride (ASES Chemical Works).

Procurement of Animals: We received male Wistar rats weighing between 100 and 150 grams. They were kept in cages with ventilation, given a regular pellet meal, and allowed unlimited access to water. The ethical requirements for investigating experimental plants in conscious animals were adhered to in all of the research. The Animal Ethics Committee accepted the research protocol.

Anti-nociceptive Activity after Acute Administration:

Tail-Flick Test: The tail-flick technique was used to assess the extract's antinociceptive (analgesic) activity. Each rat was submerged in warm water that was kept at 50°C approximately 5 cm from the distal end of its tail. The rat's response time (measured in seconds) was how long it took it to flick its tail in discomfort. Reaction time was calculated as the mean of the next two readings, with the first reading being excluded. Prior to (0 min) and at 15, 30, 45, and 60 min following the administration of the medications, the response time was measured.

To minimize damage to the tail tissue, the maximum response time was set at 15 seconds. A value of more than fifteen seconds would be regarded as maximal analgesia. The greatest amount of analgesia (MPA) was calculated as follows:

MPA = Reaction time for treatment reaction time for saline
15 sec - reaction time for saline × 100.

Statistical Analysis: The results are expressed as mean ± SD (n = 6). Statistical significance was determined by ANOVA and subsequent Turkey's test. P values less than 0.05 were considered as indicative of significance.

Tail-Flick Test: Table 1 displays the findings of the methanol extract of *Prosopis juliflora* galls' analgesic efficacy. Throughout the 60-minute observation, rats given normal saline (negative control) did not exhibit any appreciable variation in their tail-flick reaction times. For morphine sulfate alone, there was a significant difference ($P < 0.05$) in the increase in reaction time at different time periods when compared to the baseline values among the same treatment groups.

With the exception of the extract group at 60 minutes, the duration of the reaction time in the animals treated with morphine sulfate and extract was noticeably longer than in the animals treated with saline. The maximum reaction time recorded by the group treated with extract was 8.0 s at 30 min, whereas the saline and morphine sulfate groups experienced reaction times of 4.4 s and 11.9 s, respectively. The tail-flick delay time substantially varied between the extract and morphine sulfate groups at all time periods, with the latter group experiencing a higher difference. There was no discernible difference in the reaction times of the extract and sodium salicylate. Rats given sodium salicylate therapy did not exhibit any appreciable analgesic effect as compared to extract, saline, or baseline levels (with the exception of the first 30 minutes following treatment).

TABLE 1: ANALGESIC EFFECT OF METHANOLIC EXTRACT FROM THE *PROSOPIS JULIFLORA*BY TAIL FLICK METHOD IN RATS

S. no.	Treatments	Reaction time in seconds (mean ± SEM)				
		0 min	15 min	30 min	45 min	60 min
1	Control (normal saline)	4.25 ± 0.57	4.50 ± 0.34	4.42 ± 0.45	4.58 ± 0.44	5.17 ± 0.80
2	Morphine sulfate	6.50 ± 1.22	11.04± 0.73^{*ab}	10.92 ± 0.84^{*ab}	11.83 ± 0.35^{*ab}	13.33 ± 0.83^{*ab}
3	Sodium salicylate	4.13 ± 0.54	5.19 ± 0.57	6.75 ± 0.62^{*a}	5.65 ± 0.56	6.79 ± 1.24
4	MEPJ	6.57 ± 0.85^{a}	7.04 ± 0.67^{a}	8.04 ± 0.73^{a}	7.00 ± 0.92^{a}	6.57 ± 0.86

All values by Student's *t*-test, significant at $P< 0.05$, and SEM = standard error mean. *$P< 0.05$ versus baseline of the respective treatment, $^{a}P< 0.05$ treatment versus control, $^{b}P< 0.05$ extract versus morphine sulfate, extract versus sodium salicylate was not significant at all time points.

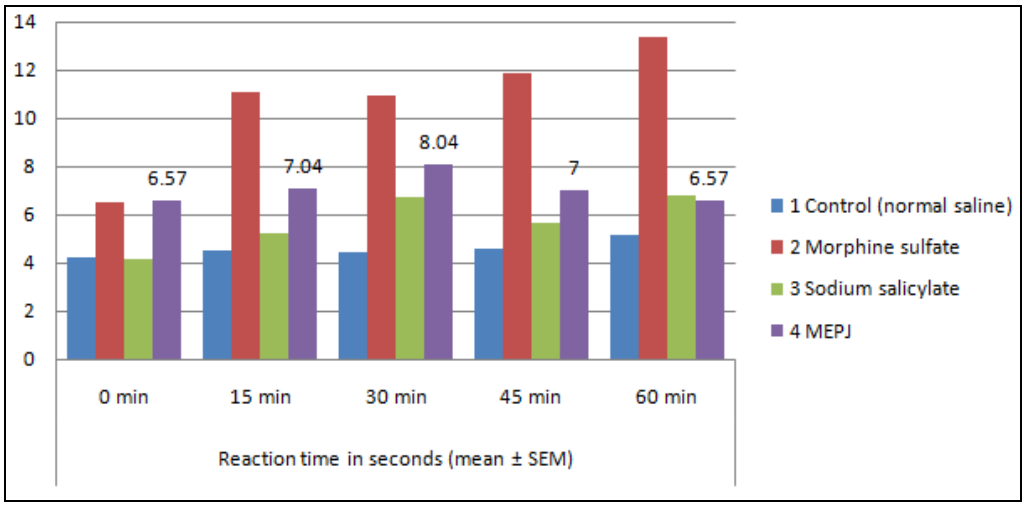

FIG. 1: ANALGESIC EFFECT OF METHANOLIC EXTRACT FROM THE *PROSOPIS JULIFLORA*BY TAIL FLICK METHOD IN RATS

Analgesics are medications that selectively reduce pain without substantially changing awareness by acting on the peripheral or central neural systems. Analgesics with central action work by increasing the threshold for pain and modifying the body's reaction to it. Conversely, analgesics with peripheral action work by preventing impulses from being generated at the location of the pain chemoreceptor. The animal models used in this work to test for analgesic activity include pain-state models that use heat stimuli, such as tail-flick techniques. Both techniques are helpful in demonstrating antinociceptive responses that are centrally mediated and often concentrate on alterations that occur above the spinal cord. The hot plate technique is thought to be a supraspinally structured reaction, whereas the tail-flick approach mediates a spinal reflex to a nociceptive stimulus. *Prosopis juliflora* methanol extract significantly reduced rats' response times in the tail-flick paradigm as compared to the control group of rats given saline treatment, with the exception of the 60-minute mark. The reference medications were sodium salicylate and morphine sulfate, which are regarded as light and moderate to strong analgesics, respectively. Throughout all observation periods, morphine and the extract had the greatest antinociception effects relative to the control, while sodium salicylate showed no discernible analgesic effects. The tail-flick technique is based on the finding that substances that resemble morphine can specifically lengthen the time it takes for rats to react to the usual tail-withdrawal effect [15]. This technique can also be used to distinguish between peripheral and central opioid-like analgesics. Animals' pain thresholds are raised by centrally acting analgesics in response to pressure and heat. Consequently, the extract's analgesic impact on this pain-state model suggests that it may be working centrally. The analgesic effects of morphine sulfate and the extract were noticeable within 15 minutes of intraperitoneal delivery, as measured by the MPA value. In contrast to morphine sulfate, the extract demonstrated short-lived analgesia as the MPA progressively dropped after 30 minutes. At every time point, the extract's tail-flick latency was lower than that of the reference medication, morphine sulfate, a long-acting opioid with a

gradual onset. The extract showed a non-significant tendency of a longer response time than sodium salicylate, despite the fact that there was no significant analgesic impact between the two. Comparable reaction times were obtained from both treatments, indicating that *Quercus infectoria* galls would be a more effective natural substitute for treating minor discomfort. It has been observed that certain alkaloids, flavanoids, steroids, and tannins that were separated from medicinal plants have strong analgesic properties. Tannin makes up as much as 60% of the total content of the galls derived from *Prosopis juliflora*, making it the main component. Thus, the presence of this molecule may be responsible for the analgesic action seen with this extract. Additionally, studies on the function of tannin in analgesic action have been published. Preliminary phytochemicals, including tannin, that were filtered out of *Prosopis juliflora* L. may be in charge of the analgesic action that was seen. According to another study, the methanol extract *of Prosopis juliflora* leaves contains flavonoids and tannins that appear to prevent the formation of prostaglandins, hence having analgesic and anti-inflammatory properties.

CONCLUSION: In this work, the number of writhing animals caused by acetic acid was greatly reduced and the latency of paw licking in the hot plate technique was significantly enhanced by the methanolic extract of MEPJ (500 mg/kg, p. o.).

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CONFLICTS OF INTEREST: Nil

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