Research Article

The Effect of Ethanoic Extract of Tetrapleuratetraptera (Uyayak) on Pain Sensitivity of Female Wistar Rats

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Abstract

Background: In African traditional medicine, the dried pods of Tetrapleura tetraptera are frequently used to manage different human ailments. In Nigeria, it is consumed in soups after childbirth to aid in wound healing, pain relief, uterine recovery, and lactation. The study investigates the impact of Tetrapleura tetraptera fruit extract on pain sensitivity using Wistar rats.

Methods: Twelve female Wistar rats were divided into two groups (Group 1 - Control and Group 2 -100mg/kg Tetrapleura tetraptera extract-fed) and received standard rat chow and water for fourteen days following which pain sensitivity was assessed using a hot plate. The results were presented as Mean and Independent Student T-test was utilized for statistical analysis with significance determined at P≤0.05. Increased pain tolerance indicated reduced sensitivity.

The escape latencies of both groups were 5secs and 10secs respectively. Group 2 demonstrated a noteworthy increase in pain tolerance compared to Group 1 ($P < 0.05$). analgesic This experimental study indicates that the ethanoic extract of Tetrapleura tetraptera fruit has properties.

Conclusion: The result of this study provides support for the use of dried Tetrapleura tetraptera pods in pain management across some communities in Southern Nigeria.

Keywords: Pain Sensitivity, Tetrapleura tetraptera, Hot plate test.

Introduction

Tetrapleura Tetraptera, commonly known as "Aidan fruit," is a plant native to West Africa, particularly the rainforest regions. It holds cultural significance in various culinary practices within this area. Referred to as Uhio in the Ibo-ethnicities and Uyayak by the Efik communities both in Southern Nigeria.

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T. tetraptera serves multiple purposes, yielding products such as timber, tannins, perfumes, aromatic oils, spices, and herbs. In Nigeria, it is used as an aromatic spice for local dishes either alone or in combination. In African postpartum practices, various herbs and mixtures are given to new mothers to enhance breast milk production and support uterine recovery. Tetrapleura tetraptera is one such herb, commonly used for this purpose. The dried fruit pods of the plant are employed in preparing soups that postpartum women consume to aid in uterine involution. These soups are typically consumed from the day of delivery onward (Kemigisha et al., 2018)[1].

Figure 1: T. tetraptera at fruiting stage

Source: Tetrapleura tetraptera Taub- Ethnopharmacology, Chemistry, Medicinal and Nutritional Values- A Review - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/T-tetraptera-at-fruiting-stage_fig1_30527014

Pain is an unpleasant emotional experience that can occur with or without actual tissue damage. It's described using terms like sharp, dull ache, shooting, etc., and can lead to reactions like crying and fainting. Pain results from actual or potential bodily injury and is often described in terms of its source, such as a burning sensation from fire or cramps from muscle contraction. Pain can be categorized as acute or chronic. Acute pain is short-lived and sharp, with a clear cause, usually localized initially before spreading. It's commonly treated with medications. Chronic pain, on the other hand, is ongoing and can vary in intensity. It lasts for extended periods and is more challenging to manage, often requiring specialized professional care. (Sembulingam. 2012)[2].

Materials and Method

A. Collection, Identification and Preparation of Plant Materials

The experiment was carried out Between February and April 2023 at the Animal Farm of the College of Health Sciences in the University of Port Harcourt. Dried Tetrapleura Tetraptera pods were procured from a local market in Obio-Akpor Local Government Area, Rivers State. The plant's authenticity was confirmed by Dr. Ajuru from the Department of Plant Science and Biotechnology at Rivers State University, Nigeria. The pods were dried and ground into a powder. Following a technique described by Abdullahi et al.[3] in 2020, maceration was employed for extraction. The pods were further pulverized into fine powder using a laboratory manual blender. The extracted powders were weighed and documented. Each sample's powder was infused in 70% ethanol over three days with intermittent stirring, followed by filtration on the third day. After extraction, the micelle was separated from the menstruum through evaporation on a water bath.

Based on previous research by Jimmy et al.[4] in 2016, the LD50 (lethal dose for 50% of the population) of Tetrapleura tetraptera is 244.94 mg/kg. Consequently, a dose of 100 mg/kg of body weight was used in this study.

B. Experimental Animals and Management

Twelve Female Wistar rats were sourced from the animal house at the Faculty of Basic Medical Sciences, University of Port Harcourt. They were housed in cages and kept under natural environmental conditions. The rats were provided with a standard diet from Flour Mill Port Harcourt. Their initial weights ranged from 87g to 103g. Before starting the experiment, their weights were measured. The study adhered to the principles outlined in the European Community guidelines for the use and care of laboratory animals, as established in 1986.

C. Study Design

Twelve female rats were divided randomly into two groups, with each group containing six rats:

1. Group 1 (Control Group): Rats in this group were given distilled water and rat chow for a duration of 14 days.
2. Group 2 (Test Group): Rats in this group were administered 100mg/kg of Tetrapleura Tetraptera along with rat chow and distilled water for a period of 14 days.

D. Determination of Pain Sensitivty

The hot-plate test evaluates sensitivity to heat-induced pain by exposing subjects to brief, intense thermal stimuli. It gauges the time taken for a response (escape attempt), assuming faster reactions indicate lower pain thresholds. Rats are positioned on a heated surface within a glass cage, equipped with a timer-linked foot pedal. The surface temperature reaches 55°C, and rats are introduced in plastic containers, individually. Once the desired behaviour is observed, the timer halts. If the rat doesn't respond within 30 seconds, the test concludes. The measured behavior is the escape latency, representing the time the rat takes to attempt moving away from the heated surface.

Results and Discussion

The results revealed that on average the rats in Group 1 had an escape latency of 5±0.51 seconds, while those in Group 2 had a latency of 10±0.86 seconds. Group 2 demonstrated a noteworthy increase in pain tolerance compared to Group 1 ($P < 0.05$).

Table 1: The Escape Latency of the Wistar Rats in Group 1 and Group 2 During the Hot Plate Test

ESCAPE LATENCY (Secs)		
Seq	**Group 1 -Control**	**GROUP 2 - Fed with 100mg/kg T.tetraptera**
R1	4	12
R2	3	10
R3	6	7
R4	6	8
R5	5	11
R6	6	12
Average	5	10

Test of Significance For Pain Sensitivity

Table 2: The Independent Student T-Test of Significance of the Escape Latency of the Wistar Rats in Group 1 and Group 2

Group Statistics					
	GROUP	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
ESCAPE_LATENCY	CONTROL	6	5.0000	1.26491	.51640
	Fed with 100mg/kg of Tetrapleura tetraptera	6	10.0000	2.09762	.85635

Independent Samples Test										
		Levene's Test for Equality of Variances		**t-test for Equality of Means**						
		F	**Sig.**	**t**	**Df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% Confidence Interval of the Difference**	
									Lower	**Upper**
ESCAPE_ LATENCY	Equal variances assumed	1.818	.207	-5.000	10	.001	-5.00000	1.00000	-7.22814	-2.77186

An independent-samples t-test was conducted to determine whether there is a difference in escape latency between the control group (Group 1) and the group fed with 100mg/kg of T. tetrapleura (Group 2). The results indicate significant difference between Group 1 (M= 5.0000, SD=1.26491) and Group 2 (M=10.0000, SD=2.09762), [t (10) =-5.000, p = .001 > .05]. The magnitude of the mean difference was-5.00000, the 95% confidence interval of the difference between means ranged from [-7.22814 to -2.77186]

and indicates a difference between the means of the sample. Consequently, we reject the null hypothesis that there is no difference between the sample means.

This study revealed that the control group exhibited a significantly lower escape latency than the test group. This experimental study indicates that the ethanoic extract of Tetrapleura tetraptera fruit has analgesic properties. The outcomes of this test corroborates with the findings reported by Ojewole, 2005[5] that Tetrapleura tetraptera extract possesses analgesic properties.

Conclusion

Pain is an important unpleasant and distressing stimuli with a potential for tissue injury and subsequent damage. In Nigeria, several medicinal plants are often administered to decrease pain sensitivity hence increasing pain tolerance. Tetrapleura tetraptera is often utilized across various locales especially among postpartum women to promote wound healing and hasten the recovery process. This study revealed that T. tetraptera increases pain tolerance and supports the use of dried Tetrapleura tetraptera pods in pain management across some communities in Nigeria.

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