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The Effectiveness of *Justicia Carnea* Extract on Wound Healing

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Abstract

Wounds are among the most common health concerns encountered in both medical facilities and everyday environments and their treatment continues to place a considerable financial strain on global healthcare systems. In recent years, the expenses associated with wound care have risen sharply, largely due to extended healing durations, recurrent infections, the necessity for advanced dressings and therapeutic procedures. These ongoing challenges have sparked growing interest in identifying cost effective and efficient alternatives, particularly those derived from medicinal plants with traditional healing significance. One 0f such plant is *Justicia carnea* popularly known as "*Hospital Too Far*," which has long been used in various African cultures to treat conditions such as wounds, anemia and inflammation.

This study investigated the wound healing efficacy of *Justicia carnea* leaf extract in comparison with povidone iodine, a widely accepted conventional treatment. Eighteen (18) Wistar rats were randomly divided into three groups: a control group, a group treated with povidone iodine and another treated with *Justicia carnea* extract. Using standard excision wound models, the rate of wound contraction was monitored over a set period. The results showed that rats receiving *Justicia carnea* extract experienced significantly faster wound closure than both the povidone iodine group and the untreated control, with statistical significance indicated by a P-value of less than 0.05.

These findings offer scientific validation for the wound healing potential of *Justicia carnea*, likely attributed to its rich phytochemical profile, including compounds with antimicrobial, antioxidant and anti-inflammatory effects. As such, the plant presents a promising, low-cost option or complementary therapy for wound care management.

Keywords: *Justicia Carnea*, Hospital too Far, Wound Healing, Povidone Iodine

Introduction

The healing of wounds is a multifaceted biological process that progresses through distinct stages: stopping bleeding (hemostasis), triggering inflammation, promoting tissue growth (proliferation), and reshaping the affected area (remodeling) [1]. Interruptions in the healing process caused by factors like infections, oxidative damage, or long-term health conditions, can lead to slower recovery and various complications. Due to the drawbacks of conventional medications, such as their expense, limited effectiveness, and growing resistance to antibiotics, researchers have turned to medicinal plants as promising alternative treatments [2].

Herbs are plants grown for their medicinal, flavoring or aromatic properties and herbal treatments are safe and efficient for treating a wide range of ailments. Western medicine or allopathy, is primarily reliant on medicinal plants for some of its constituents. Herbal plants are the traditional and widely used type of medication, according to research [3].

Justicia carnea popularly called '*hospital too far*', belongs to the family of *Acanthaceae* consisting about 600 species of herbs, shrubs and tender perennial native to the tropics, subtropics and is generally considered as an ornamental plant [4].

Several species of *Justicia* are widely used in folk medicine for the treatment of inflammation, respiratory and gastrointestinal disorder [5]. Most of the medicinal properties exhibited by plant extracts such as antimicrobial, antioxidant, hypocholesterolemic and anti-cancerous are associated with their bioactive constituents mainly phenols and flavonoids [6]. It has also been reported to be rich in both macronutrients and trace elements of which calcium and iron are in high quantity, therefore, it is used as blood tonic locally in many parts of Nigeria [7, 9].

Also, studies have shown that the extract of *justicia carnea*, caused an increase in white blood cell count, hemoglobin concentration, significant reduction in bleeding time, increased prothrombin time, partial thromboplastin time, total iron binding capacity and serum ferritin values at high dosages [8].

Due to the impact of oxidative stress and microbial buildup on slowing wound recovery, *J. carnea* is being increasingly recognized as an affordable option for enhancing tissue regeneration [2].

There's however paucity of literature and data concerning the wound healing properties of the leaf. Hence this study bridges that knowledge gap by exploring the effectiveness of *justicia carnea* on wound healing.

Literature Review

Multiple research findings have shown that the leaves of *J. carnea* are rich in various phytochemicals including phenolics, flavonoids, glycosides, terpenoids, alkaloids and tannins [5]. These bioactive compounds possess antimicrobial, antioxidant and anti-inflammatory properties that play a vital role in wound healing by minimizing oxidative damage, preventing infections and supporting the development of granulation tissue [7].

Wound healing is hindered by oxidative stress which harms essential cellular components like proteins, lipids and DNA [1]. In laboratory studies, *J. carnea* extracts have shown strong ability to neutralize free radicals, a benefit linked to their rich concentration of phenolic and flavonoid compounds [5]. Its ability to reduce inflammation is associated with the suppression of pro-inflammatory agents, which helps prevent extended inflammatory responses that can hinder the wound healing process [6].

Infections caused by microbes significantly slow down the wound healing process. Research indicates that *J. carnea* extracts can suppress bacteria like *Staphylococcus aureus* and *Escherichia coli*, both frequently linked to wound related infections. This antibacterial capability reinforces its traditional application in treating wounds [2, 7].

Research involving animal models with excision and incision wounds has shown that applying or ingesting J. carnea extracts speeds up wound contraction, boosts collagen production, and improves skin regeneration when compared to untreated subjects. These results offer scientific validation for its traditional use in healing wounds [6, 7].

Although treatments like silver sulfadiazine and antibiotics are widely regarded as the standard for wound care, herbal options such *as J. carnea* offer cost-effective, easily obtainable and culturally familiar alternatives, especially valuable in rural areas with limited access to modern medical services [5]. The synergy of its antioxidant, antimicrobial and anti-inflammatory properties positions *Hospital Too Far* as a strong contender for comprehensive wound care approaches.

Materials And Method

The materials used in this study included *Justicia carnea ("Hospital Too Far")* leaf extract, eighteen (18) Wistar rats, standard animal cages, povidone iodine solution (5%), standard finisher feed (Top Feed, Nigeria), cotton wool, organ bottles, Hematoxylin and eosin (H&E), distilled water, an animal weighing balance, a microscope and a microtome.

A total of eighteen healthy Wistar rats weighing between 110–260 g were procured and housed in the Animal House of the Bayelsa Medical University. The animals were acclimatized for two weeks under standard laboratory conditions, fed *ad libitum* and their cages were cleaned weekly to maintain hygiene [11]. The *J. carnea* extract and povidone iodine were prepared in aqueous solution before administration. Dermal toxicity was assessed using preliminary sighting and limit tests in line with OECD guidelines [12].

After acclimatization, the rats were randomly assigned into three groups of six animals each (n = 6) following the procedure of Morton and Malone [10]. Under anesthesia, a 1cm² excision wound of approximately 2mm depth was created on the dorsal region of each rat. Treatments were administered once daily: Group 1 (control) received distilled water, Group 2 was treated with *J. carnea* leaf extract and Group 3 received 5% povidone iodine solution.

The wound healing parameters assessed over a 21-day period included epithelialization time, wound contraction rate and wound closure day [6]. At the end of the study, healed skin tissues from all groups were harvested and subjected to histopathological analysis using H&E staining.

Group 1 (Control): Distilled water
Group 2 (Test): *Justicia carnea* leaf extract
Group 3 (Standard): Povidone iodine solution (5%)

Results

Table 1: Mean Area of Wound Contraction in Different Days

Days	Control	(Providine iodine	*Justicia carnea*	p-value	Inference
2	0.23±0.03	0.28±0.01	0.27±0.02	0.002	Significant
4	0.16±0.02 [b]	0.34±0.03 [a]	0.31±0.03 [a]	0.000	Significant
6	0.12±0.01 [b]	0.28±0.02 [a]	0.33±0.02 [a]	0.000	Significant
8	0.10±0.02 [b]	0.27±0.02 [a]	0.29±0.04 [a]	0.000	Significant
10	0.07±0.01 [b]	0.21±0.02 [a]	0.35±0.01 [a b]	0.000	Significant
12	0.05±0.01 [b]	0.17±0.02 [a]	0.32±0.03 [a b]	0.000	Significant
14	0.04±0.01	0.09±0.01	0.26±0.02 [a b]	0.000	Significant
16	0.02±0.01	0.07±0.01	0.19±0.03 [a b]	0.000	Significant
18	0.01±0.00	0.03±0.01	0.17±0.02 [a b]	0.000	Significant
20	0.00±0.00	0.01±0.00	0.08±0.02 [a b]	0.000	Significant

Values are in Mean ± SEM.

Superscript 'a' and 'b', indicate significant difference ($p<0.05$) compared to Control and Providine iodine groups respectively.

P: statistical level of significance was determined by one-way Analysis of Variance (ANOVA) followed by Tukey post-hoc test.

Table 2: Mean Percentage of Wound Contraction in Different Days

Days	Control	(Providine iodine	*Justicia carnea*	p-value	Inference
2	-13.67±13.78	-40.08±7.34	-36.50±9.06	0.002	Significant
4	13.00±12.61 [b]	-71.94±13.02 [a]	-53.00±15.92 [a]	0.000	Significant
6	31.33±12.96 [b]	-75.17±29.52 [a]	-67.17±7.83 [a]	0.000	Significant
8	20.60±16.56	-32.00±9.23	-42.67±18.08 [a]	0.002	Significant
10	67.50±5.57 [b]	-2.67±11.44 [a]	-73.38±6.44 [a b]	0.000	Significant
12	87.17±2.34 [b]	17.50±7.94 [a]	-32.50±28.01 [a]	0.000	Significant
14	80.83±2.87 [b]	56.50±6.88 [a]	-29.17±8.87 [a b]	0.000	Significant
16	88.83±2.48	64.33±6.21	70.50±76.38	0.429	Not

					significant
18	95.17±1.11	84.67±3.28	14.32±11.15 [a b]	0.000	Significant
20	98.17±0.48 [b]	63.33±20.06 [a]	59.17±10.72 [a]	0.000	Significant

Values are in Mean ± SEM.

Superscript 'a' and 'b', indicate significant difference ($p<0.05$) compared to Control and Providine iodine groups respectively.
P: statistical level of significance was determined by one-way Analysis of Variance (ANOVA) followed by Tukey post-hoc test.

Table 3: Mean epithelization and wound closure time in Days

Groups	Epithelization time
Control	16.00±1.15
Providine Iodine	14.49±1.90 [x]
Hospital too far leaf	16.00±2.31
P-value	0.516
Inference	Significant

Values are in Mean ± SEM.

Superscript "x', indicate significant difference ($p<0.05$) compared to Control and Providine iodine groups respectively.
P: statistical level of significance was determined by one-way Analysis of Variance (ANOVA) followed by Tukey post-hoc test.

Table 4: Mean Wound Closure Time in Days

Groups	Wound closure time
Control	18.67±0.67
Providine Iodine	17.67±0.67
Hospital too far leaf	19.00±0.63
P-value	0.394
Inference	Significant

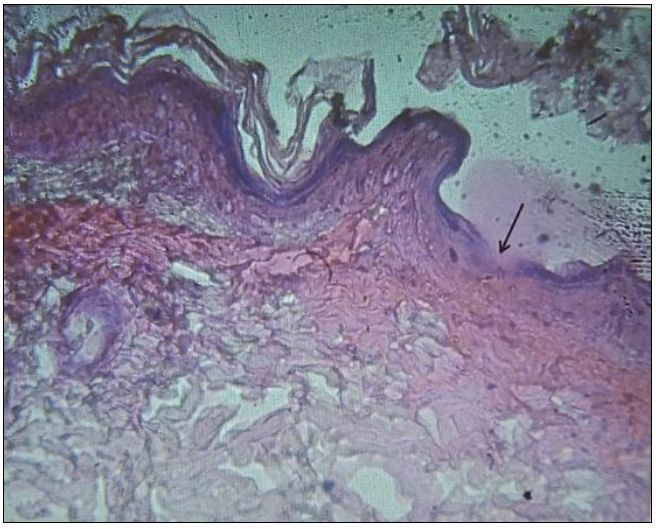

Fig 1: Wound Treated With Iodine

Photomicrograph (H&E X400) of skin showing a stage 3 wound healing (arrow) in the epidermis; there is epithelialization of the stratum corneum with oedematous scab.
Diagnostic Lesion: Moderate Epithelialization.

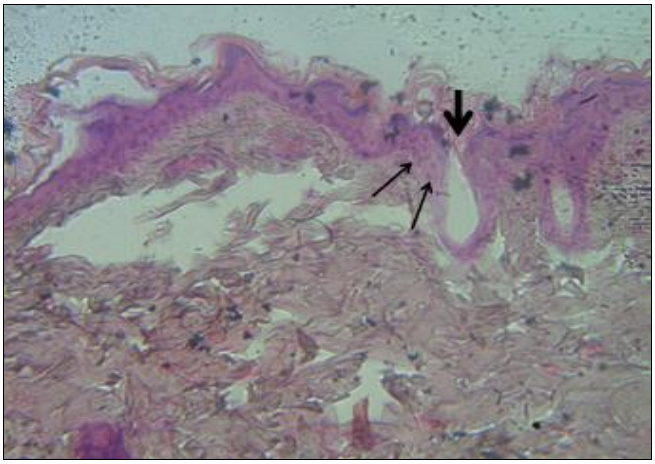

Fig 2: Wound Treated with *Justicia Carnea* (Hospital Too Far)

Photomicrograph (H&E X400) of skin showing a wound in the epidermis with wound debris (WD). The stratum corneum is severed (arrow).
Diagnostic Lesion: Non-epithelial Skin Wound.

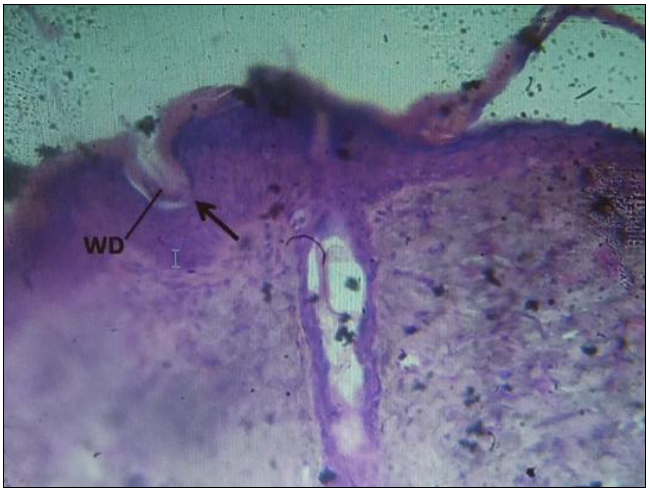

Fig 3: Normal Wound Untreated

Photomicrograph (H&E X400) of skin showing a wound in the epidermis with wound debris (WD). The stratum corneum is severed (arrow).
Diagnostic Lesion: Non-epithelial Skin Wound.

Discussion

This study evaluated the wound healing efficacy of the indigenous formulation *justicia carnea (Hospital too far)* in comparison to the standard antiseptic povidone iodine in Wistar rats. Key metrics assessed included wound area contraction, percentage wound contraction, epithelization time and wound closure duration.
Rats in the *justicia carnea* group generally showed better weight maintenance and gain compared to the control, suggesting systemic tolerance and possibly beneficial properties of the extract. Povidone iodine treated rats showed the highest mean weight in some instances, possibly due to reduced infection burden from its strong antimicrobial properties.
In terms of wound contraction area, povidone iodine consistently produced significantly greater contraction than the control group through all observation days. However,

justicia carnea showed impressive performance from day 6 onward, with contraction values rivalling or surpassing those of povidone iodine, particularly on days 10 to 20.

Percentage wound contraction mirrored these findings, with both treatment groups significantly outperforming the control. Povidone iodine had faster early wound contraction but *justicia carnea* showed progressive improvement and sustained healing through to day 20. Notably, while povidone iodine reached 63.33±20.06% contraction by day 20, *justicia carnea* approached 59.17±10.72%, indicating comparable efficacy.

Epithelization time was slightly shorter for povidone iodine (14.49±1.90 days) compared to *justicia carnea* (16.00±2.31 days), though this was not statistically significant ($p = 0.516$). Similarly, wound closure time was 17.67±0.67 days for povidone iodine versus 19.00±0.63 days for *justicia carnea* ($p = 0.394$).

These results suggest that while povidone iodine remains a gold standard for wound care due to its potent antimicrobial effects, *justicia carnea* presents an encouraging natural alternative with comparable wound healing capabilities. Its use could be particularly beneficial in rural or resource constrained settings where access to conventional medicine is limited.

Conclusion

Both *justicia carnea* and povidone iodine significantly enhanced wound healing in Wistar rats compared to the untreated control. Povidone iodine showed a faster onset of contraction and epithelization, while *justicia carnea* demonstrated comparable outcomes over time. The results suggest *justicia carnea* could serve as a viable alternative for wound treatment in traditional or low-resource healthcare contexts. Further investigation is needed to determine its active compounds and long-term safety profile.

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Conflict of Interest

No conflict of interest.

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