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HISTOPATHOLOGICAL WOUND HEALING ASSESSMENT OF METHANOLIC LEAVES EXTRACT OF *Jatropha tanjorensis* ON WISTAR RATS

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ABSTRACT

Background: *Jatropha tanjorensis,* commonly known as 'hospital too far' is a nutritious vegetable often taken as soup in various parts of Nigeria. It has been used in traditional medicine for various purposes. Wound healing is a complex and dynamic process of replacing devitalized and missing cellular structures and tissue layers. Wound healing is a major clinical challenge, and medicinal plants continue to attract interest for their potential therapeutic benefits.

Aim: This study aimed to evaluate the wound healing properties of methanolic leaf extract of *Jatropha tanjorensis* in wistar rats.

Material and Methods: A physical and phytochemical analysis was carried out. The study involved creating a 1.5cm full thickness wound on the dorsal region of 15 healthy Wistar rats. Two ointment formulations percentages (1% and 2%) of the leaf's extracts were prepared using Vaseline as a base ointment and applied topically to the wounded rats. The rats were divided into five different groups; negative control, vehicle control, standard drug, the two test groups which were treated with 1% and 2% of the extract. The wound length and percentage of recovery were measured on the 4^{th}, 7^{th}, 10^{th} and 13^{th} days ($p > 0.05$), and histological analysis of the wounded area was performed on the 14^{th} day.

Results: Sweet scent, charcoal green color, 4.4 g crude extract and a percentage yield of 2.5% were obtained from the physical properties of the extract. Flavonoid, Alkaloid, Terpenoids, Tannins, Phenol, Saponins and Cardiac glycosides were determined. The highest extract concentration (2%) demonstrated the best wound contraction over time. The histological analysis demonstrated improved cellular proliferation, epidermal regeneration, collagen formation, new blood vessel formation, and granulation tissue formation.

Conclusion: The research showed that *Jatropha tanjorensis* has a wound healing property most notable at higher concentrations.

Keywords: *Jatropha tanjorensis,* Wound healing, wistar rats,Vaseline, Flavonoid

INTRODUCTION

Wound is formed as a result of tissue injury that disrupts the anatomical architecture and leads to the loss of function and normal growth, the ability of a patient with wound to regenerate and repair damaged tissues is a definite advantage for survival [1]. A wound can either occurs in different ways such as abrasions which is a scrape occurred on the skin against hard surface or rough surface, punctures a small and deep hole occurred as a result of pointed or sharp object, a laceration that occurred as a deep cuts to skin, burns that are caused as a result of heat, chemicals, radiation, sun or electricity, also, there is a wound that occurred as a result of evulsions which is

severe form of wound that occurred as a result of complete removal of different layers of skin, mostly lead to the exposing of fat muscle layers and some visible structures beneath [2].

Wound healing is a physiological natural reaction to tissue injury, that involves series of complex mechanisms that interplay within numerous cell types, such as vascular system, cytokines, cell mediators, inflammation as well as growth factors [3]. Every wound undergoes different cascades and stages of healing processes depending on the type of wound as well as its severity. Wound healing classified into three main types such as primary, secondary and tertiary wound healing [3]. Wound healing is a dynamic and complex mechanisms that involve different processes such as hemostasis, inflammation, proliferation as well as tissue remodeling [4]. Hemostasis happened immediately after the injury, to avoid exsanguination, vasoconstriction occurs later platelets triggered activation, adhesion as well as aggregation at the vicinity of the injury [5]. Inflammatory cascade involves phagocytic cells that result to production of reactive oxygen species, that takes up to one week in acute wounds, in chronic wound longer than one week [6]. The inflammatory events involve phagocytic cells that brings about the release of oxygen reactive species (ROS), that last about one week in an acute wound stage and no longer in chronic wounds stage [6]. At the proliferative stage of wound healing, new granulation tissue or connective tissue in formed at same time with other healing processes, at the end granulation tissue is replaced by normal connective tissue as the wound healing processes [7]. Approximately 21 days following the injury remodeling begins, at this stage the net collagen content of the wound is stable and is possible to continue indefinitely [8].

Although with the availability of pharmaceutical drugs on wound healing, with various natural as well as synthetic wound dressings, an interest in using plant products for wound healing continues to grow because of their lower side effects, cost effectiveness as well as cultural acceptance [9]. For decades plants has been used for a long time as tradition medicine to treat wounds, it was observed to show a promising anti-inflammatory, antimicrobial as well as regenerative properties with respect to wound healing [10]. We proposed to use this plant (*Jatropha tanjorensis*) to find the histological wound healing effect of the plant.

Jatropha tanjorensis a plant of a member of Euphorbiaceae family. This plant grows usually in a rain forest area of West Africa and traditionally it has been used in folk medicine and veterinary purposes [11]. This plant is called ‘Kafi ugu’ in Hausa, ‘Efo Iyana Ipaja’ or ‘Efo Jerusalem’ in south-west Nigeria and ‘Hospital too far’ in Niger Delta areas of Nigeria [11]. This plant is edible because it contained vitamins and minerals in its leaves, the bark of the plant, leaves and seeds, almost all component of the plant are used in traditional folk medicine, it has also been used as veterinary treatment as fresh or as a decoction. This plant was also found to contain some phytochemical constituents responsible of decreasing blood cholesterol levels, which qualified it to be successful in the treatment of hyperlipidaemia-related cardiovascular diseases [12]. This plant was identified to have a leafy vegetable, rich in phytochemical constituents such as alkaloids, flavonoids, saponins, tannins and polyphenols, which was found to possess wound healing property by promoting inflammatory modulation, collagen synthesis as well as reducing oxidative stress [13] . Previous research has shown that *Jatropha tanjorensis* is one of the rich plants in Southeastern Nigeria that used by ethnic people to manage and treat different disease conditions. It has been used for a long period of time for the treatment of diseases caused by bacterial pathogens [14]. This plant is also employed for the treatment of malaria, diabetes and anemia [15].

MATERIAL AND METHODS

Ethical Approval

The ethical approval was obtained from ethics and research committee of Usmanu Danfodiyo University Sokoto with the Ref/ID No: HBREC/25/038.

Collection Of *Jatropha Tanjorensis* Leaves

The leaves of *Jatropha tanjorensis* was collected from Arkilla, Wamakko Local Government, Sokoto State.

Identification Of *Jatropha Tanjorensis* Leaves

Jatropha tanjorensis was identified at the herbarium unit of the Department of Pharmacognosy and Ethno Medicine, Faculty of pharmaceutical sciences, Usmanu Danfodiyo University Sokoto and the following voucher number PCG/UDUS/EUPH/0014 was given.

Preparation Of Plant Material, Extraction And Phytochemical Screening

Preparation of Plant Material and Extraction

A quantity of *Jatropha tanjorensis* leaves was collected and dried under shade for 7 days, and grinded into fine powder using an electric grinder. The extract was obtained by macerating 175g of the powdered leaves in 700mls of 98% methanol for 48hrs, followed by filtration with a mesh and then Whatman no. 1 filter paper, then the filtrate was concentrated in a hot air oven to obtain crude methanol extract as described by Chibuogwu *et al.,* (2021) [15]. The various concentration employed in the study was later prepared while carrying out the study by incorporating appropriate grams (1g and 2g) of the extract in a base ointment (Vaseline, 99g and 98g respectively).

Phytochemical Analysis

The confirmatory qualitative phytochemical analysis of the methanolic leaves extract of *Jatropha tanjorensis* was performed to identify some of the main compounds present in the extract [16].

1. Test for alkaloids (Wagner's test): about 2ml of the methanolic leaves extract of Jatropha tanjorensis filtrate was mixed with 1ml of dilute hydrochloric acid, Wagner's reagent was then added in drops and shake well. Formation of reddish-brown precipitate was observed for, which indicates the presence of alkaloids [17].
2. Test for tannins: about 200mg of the extract was boiled with 10ml of distilled water, and 0.1% ferric chloride was added to the mixture, it was then observed for blue-black colouration which indicates presence of tannins [16].
3. Test for saponins: about 0.5ml of the extract and 5ml of distilled water was combined and agitated, the formation of foam was observed which indicates the presence of saponins [16].

4. Test for flavonoids: 200mg of the extract was mixed with 10ml of ethanol and filtered, 2ml of the filtrate was then mixed with concentrated HCL and magnesium ribbon. The formation of red or pinkish colour was then observed which indicates the presence of flavonoids [16].
5. Test for phenols: about 1mg of the extract was combined with three drops of ferric chloride and 1ml of potassium ferricyanide ($K_2Fe(CN_6)$). Formation of greenish-blue colour was observed which indicates the presence of phenols [16].
6. Test for terpenoids: Five milliliters of the extract were combined with 2 ml of chloroform, after which 3 ml of concentrated sulfuric acid was carefully added to form a separate layer. The appearance of a reddish-brown color at the interface indicated a positive result for the presence of terpenoids [18].
7. Test for cardiac glycosides: Two milliliters of the extract were mixed with 1 ml of glacial acetic acid, one drop of 5% $FeCl_3$, and 1 ml of concentrated H_2SO_4. The formation of a brown ring at the interface indicated the presence of cardiac glycosides [19].

Experimental Animals

Fifteen (15) healthy Wistar rats of 10-12 weeks of age weighing between 165-180g were used for the research. The rats were kept in a clean stainless-steel cage for acclimatization with twelve hours of light and dark cycles for a week before the procedures were commenced. The rats were fed with standard pellet diet and water obtained from the Department of Pharmacology and Toxicology, College of Health Science, Usmanu Danfodiyo University Sokoto.

GROUPING OF ANIMALS

The totals of fifteen (15) Wistar rats were randomly assigned into 5 groups of three (3) Wistar rats per group, and kept in different cages according to their groupings.

TABLE 1: Animal Grouping

S/N	Group	No. of rats	Treatment
1	Group A (Negative control)	3	Cleaned with normal saline, allowed to heal naturally
2	Group B (Vehicle control)	3	Treated with Vaseline (Base ointment)
3	Group C (Positive control)	3	Treated with 1% silver sulfadiazine (standard drug)
4	Group D (Test I)	3	Treated with 1% *Jatropha tanjorensis* leaves extract
5	Group E (Test II)	3	Treated with 2% *Jatropha tanjorensis* leaves extract

Wound Creation Procedure

The back of each of the Wistar rat was disinfected with 70% ethanol, then it was shaved to expose the dorsal skin. Cotton wool was then moistened with chloroform and placed in suffocation chamber together with the rats for about one minute in other to calm the animals. 1.5cm length of full thickness wound was made on the shaved dorsum area of each rat using a surgical blade [20]. All the animals' tail was labelled with different colors according to their group, and were kept in separated groups of three rats per cage. The intervention substances

were topically applied daily in respect to each group and the wounded areas were left open. The treatments were continued for thirteen days. The animals were sacrificed on the 14th day.

Biophysical Wound Healing Assessment Method

Biophysical parameters of wound healing were assessed by evaluating wound length. The percentage of wound healing and duration were assessed on the Day 4, 7, 10 and 13 in cm unit. The percentage of wound healing was calculated using the formula [20]:

$$\%\ of\ healing = \frac{wound\ length\ on\ day\ one - wound\ length\ on\ day\ x}{wound\ length\ on\ day\ one} \times 100$$

Where x is the day the wound length is measured.

Histological Analysis

Animal Sacrifice and Sample Collection

After the 13days of topical application, the rats were sacrificed on day 14 by chloroform overdose and about 2×2cm square of the wounded areas were surgically excised using surgical blade and dissecting forceps from each 15 Wistar rats, samples were washed with normal saline and fixed in 10% neutral buffered formal saline.

Fixation of Tissue Sample

About 2×2cm square of wounded area obtained from each rat was fixed immediately in 10% neutral buffered formal saline for 48 hours.

Tissue Processing

Samples obtained from fixation for 48 hours was grossed and processed using automatic tissue processor based on the below schedule [21]:

TABLE 2: Tissue processing schedule

Beaker Number	Reagent Used	Time	Purpose
1	10% Formalin	1Hour	Fixation
2	70% Alcohol	1Hour	Dehydration
3	90% Alcohol	1Hour	Dehydration
4	Absolute Alcohol I	1Hour	Dehydration
5	Absolute Alcohol II	1Hour	Dehydration
6	Absolute Alcohol III	1Hour	Dehydration
7	Xylene I	1Hour	Clearing
8	Xylene II	1Hour	Clearing
9	Xylene III	1Hour	Clearing
10	Molten Wax I	1Hour	Impregnation
11	Molten Wax II	1Hour	Impregnation
12	Molten Wax III	1Hour	Impregnation

Tissue Embedding

Embedding center machine and Tissue tek moulds was used for embedding. Embedding moulds (depending on tissue size) were placed at work station and filled half way with molten paraffin wax. The processed tissues were then transferred from tissue cassette and placed at the center of

the mould, they were oriented making sure the cut edge is facing downward. The moulds were then covered with pre labeled cassette and was filled with molten paraffin wax to the brim. The moulds were then transferred onto cold compartment for rapid solidification. After solidification the moulds were detached and the tissue block formed were ready for sectioning [21].

Tissue Microtomy

Rotary microtome machine was used to trim the tissue block at 10um. The blocks were then placed downward on ice tray for about 60 minutes. Two thin sections of 3µ was then cut (from each block), a slide was used to transfer the sections into 20% alcohol, and was then transferred into floating out water bath pre-set at 10^0C below melting point of paraffin wax used. The sections were then picked on 2 different albumenized microscope glass slide which was then placed on a hot plate pre-set at 10^0C above melting point of the paraffin wax used [21]. The two sections obtained from each sample was stained by Hematoxylin and Eosin staining method and Wiegert Van Gieson respectively.

Hematoxylin and Eosin (H&E) Staining Method

Histopathological studies were performed by Haematoxylin and Eosin staining method for the following wound healing parameters; new blood vessels, epidermal regeneration, re-epithelization, proliferating fibrous tissue and inflammation. One section from each block sectioned, was stained by hematoxylin and eosin staining method, and examined microscopically. Digital photomicrography of each was captured at representative locations using a digital camera attached to the microscope. Sections were stained base on the procedure below [21]:

- The sections were dewaxed with two changes of xylene for 10 minutes in each.
- The sections were then hydrated in descending grades of alcohol (absolute, 90%, 70%, 50% and water) for 2 minutes in each.
- They were then washed in water.
- The sections were then stained with Harris hematoxylin solution for 10 minutes.
- They were then washed in water and differentiated briefly in 1% acid alcohol.
- They were then washed in water and blued in Scott's tap water for 2 minutes.
- The sections were then washed in water and counter stained with 1% eosin solution for 2 minutes.
- They were then washed in water and dehydrated in ascending grades of alcohol (70%, 90% and absolute alcohols) for 2 minutes in each.
- They were then cleared in xylene and mounted using DPX.
- The sections were then viewed under microscope at ×10 objective, scored appropriately, recorded and analyzed.

Weigert Van Gieson (WVG) Staining Method

The other sections cut were stained by Weigert Van Gieson staining technique to assess the collagen fibers. They were stained following the procedure below [21]:

- The sections were deparaffinized in three changes of xylene for 5 minutes in each.
- The sections were then hydrated in descending grades of alcohol for 2 minutes in each and then washed in water.
- Nuclei was stained with Weigert iron hematoxylin for 10 minutes and washed in running tap water for 5 minutes.
- The sections were then stained with Van Gieson's solution for 3 minutes.
- They were then rinsed in water and dehydrated rapidly in absolute alcohol.

- The sections were then cleared in xylene and mounted in DPX.

Statistical Analysis

The values were expressed as mean ± standard error of mean (SEM). Data analysis was performed using statistical package for the social science (SPSS) software version 25.0 and was analyzed using two-way repeated measures analysis of variance (ANOVA) and pair wise comparison Tukey Post Hoc Test. A difference at $p<0.05$ is considered significant.

RESULTS

Physical properties of *Jatropha tanjorensis* leaves extract

1. It has a sweet scent.
2. It has a charcoal green color.
3. 4.4g crude extract was obtained.
4. It gives a percentage yield of 2.5%.

TABLE 3: Phytochemical constituents of *Jatropha tanjorensis* leaves extract

Parameters	Results	Remark
Flavonoid	+	Present
Alkaloid	+	Present
Terpenoids	+	Present
Tannins	+	Present
Phenol	+	Present
Saponins	+	Present
Cardiac glycosides	+	Present

Wound after intervention

The wounds were assessed for biophysical parameters on Day 13 physically for the last time prior to sacrifice. Group A, the wound size has reduced but still looking fresh. Group B, C, D and E, the wounds had almost healed completely seen in figure 1.

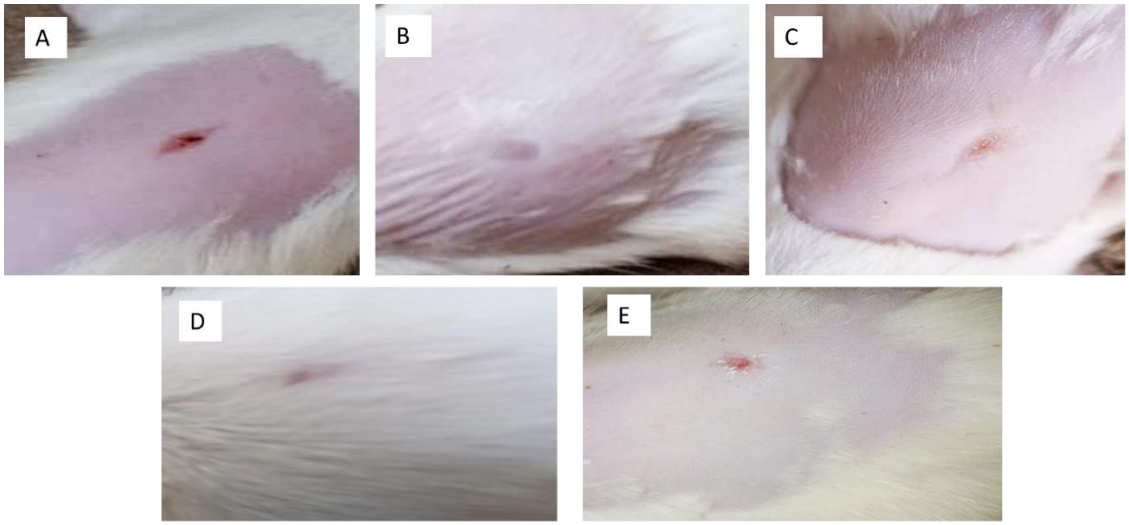


FIGURE 1: Image of the surgical wound on rats Day 13; Group A (untreated, cleaned with normal saline), Group B (treated with base ointment), Group C (treated with 1% silver sulphadiazine), Group D (treated with 1% *Jatropha tanjorensis* extract), Group E (treated with 2% *Jatropha tanjorensis* extract).

Wound Length Measurement

Wound healing process was assessed by macroscopically. Results of the macroscopic study showed the biophysical parameters of wound healing which include; evaluation of the wound length contraction (Table 4). There were significant statistical differences in wound length contraction between the untreated group and treated groups on the 4th day, 7th, 10th and 13th day.

TABLE 4: Wound Length Measurement and Percentage Healing in all Study Groups Across Various Days

Group	Day 4	Day 7	Day 10	Day 13	*P–value*
GROUP A (N.S)	1.37±0.06(11.33)^{a}	0.97 ± 0.12(35.33)^{a}	0.77 ± 0.06(49.33)^{a*}	0.53 ± 0.06(64.67)^{a**}	0.0001
GROUP B (VS)	1.23 ± 0.06(18)^{b}	0.77 ± 0.06(48.67)^{b}	0.47 ± 0.21(68.67)^{b}	0.27 ± 0.12(82)^{b*}	0.0001
GROUP C(1%SSD)	1.20 ± 0.00(20)^{b}	0.93 ± 0.06(38)^{a}	0.47 ± 0.06(68.67)^{b}	0.20 ± 0.10(86.67)^{b*}	0.0001
GROUP D (1% JTE)	1.23 ± 0.06(18)^{b}	0.90 ± 0.10(40^{a}	0.53 ± 0.21(64.67)^{b}	0.20 ± 0.10(86.67)^{b*}	0.0001
GROUP E (2% JTE)	1.20 ± 0.00(20)^{b}	0.83 ± 0.06(44.67)^{b}	0.43 ± 0.15(71.33)^{b}	0.13 ± 0.06(91.33)^{c*}	0.0001
F- Value	7.167	2.9	2.36	9.17	
P – value	0.005	0.78	0.12	0.002	

Key: N.S (normal saline), VS (Vaseline), 1% SSD (1% silver sulphadiazine), 1% JTE (1% *Jatropha tanjorensis* extract), 2% JTE (2% *Jatropha tanjorensis* extract). Values are expressed in Mean ± Standard error of mean (SEM). Values in parenthesis indicates % wound healing, Different superscript shows significance difference while same superscript shows no significant differences between group, (*) shows significant at p – value < 0.05, (**) shows significant at p–value < 0.01. Lower values indicate improved healing. GRP E (2% extract) shows the shortest wound length at Day 13, indicating superior wound healing performance

Histological Examinations

Hematoxylin and Eosin

The microscopic examination obtained from Hematoxylin and Eosin-stained sections show histological structures including: epidermal regeneration, hair follicle, epidermal layer, fibroblast, granulation tissue, angiogenesis and tissue thickness as shown in **(PLATE 1).** It was observed that the untreated group showed absence of epithelization and incomplete regeneration. The group treated with the base ointment (Vaseline) demonstrated a good epithelization with formation of few new blood vessels. The 1% sulphadiazine treated group demonstrated a more complete epithelization with formation of new blood vessels. The experimental group showed formation of new blood vessels and epithelization.

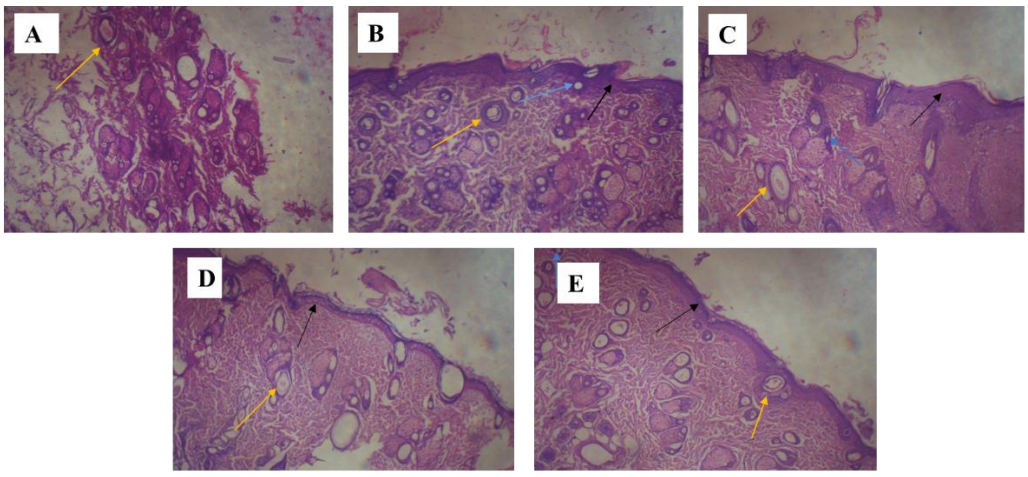


PLATE 1: Photomicrograph of skin section. H&E X 100 **(A)** Untreated group, Yellow arrow: hair follicle. **(B)** Group treated with Vaseline, Black arrow: epidermal regeneration, Blue arrow: blood vessel, Yellow arrow: hair follicle. **(C)** Group treated with 1% SSD, Black arrow: epidermal regeneration, Blue arrow: blood vessel, Yellow arrow: hair follicle. **(D)** Group treated with 1% JTE, Black arrow: epidermal regeneration, Yellow arrow: hair follicle. **(E)** Group treated with 2% JTE, Black arrow: epidermal regeneration, Blue arrow: blood vessel, Yellow arrow: hair follicle.

Weigert Hematoxylin and Van Gieson

The histologic sections stained with Weigert Hematoxylin and Van Gieson demonstrated collagen fibers **(PLATE 2).** The untreated group show moderate presence of collagen fibers with irregular dispersion. The group treated with the base ointment (Vaseline) show scanty collagen fibers. The 1% sulphadiazine treated group show abundant collagen fibers. The experimental groups show more abundant collagen fibers with regular dispersion.

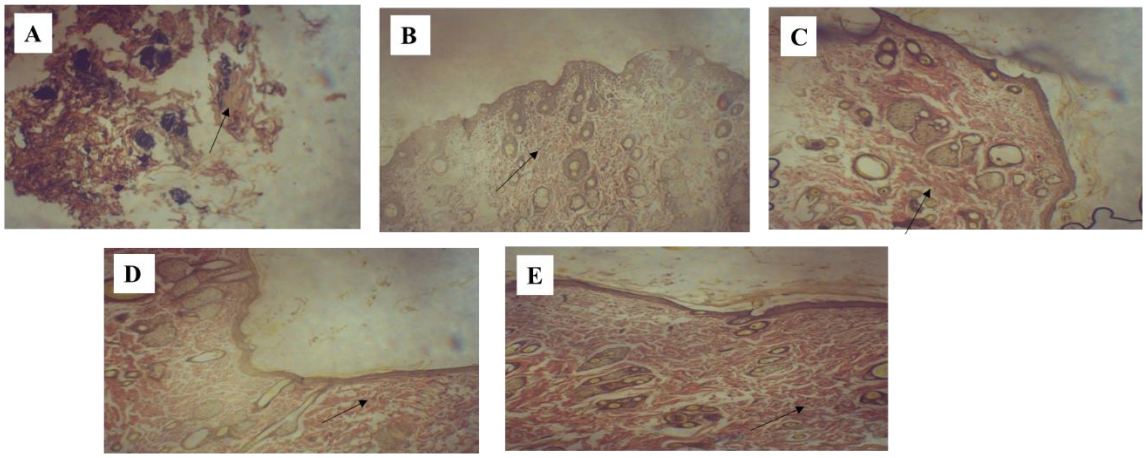


PLATE 2: Photomicrograph of skin section. WVG X 100 **(A)** Untreated group, Black arrow: collagen fibers. **(B)** Group treated with Vaseline, Black arrow: collagen fibers. **(C)** Group treated with 1% SSD, Black arrow: collagen fibers. **(D)** Group treated with 1% JTE, Black arrow: collagen fibers. **(E) Group t**reated with 2% JTE, Black arrow: collagen fibers.

DISCUSSION

The current study revealed the phytochemical constituents of *Jatropha tanjorensis* including; flavonoids, tannins, saponins, phenols, alkaloids, terpenoids, and cardiac glycosides in the methanolic extract. Flavonoids and phenolic compounds are known to enhance collagen synthesis and support fibroblast proliferation, thereby facilitating tissue regeneration [19, 13]. Tannins promote wound contraction through protein precipitation, while saponins are associated with angiogenesis and improved epithelial regeneration (16). These phytochemicals have widely been reported to contribute to wound healing through antimicrobial, antioxidant, and anti-inflammatory pathways as reported by Ndem *et al*., (2019) [22]. In this study we have seen fibroblast proliferation, tissue regeneration, wound contraction and closure, angiogenesis and re-epithelization through the action of the extract, all these could be attributed by the phytochemical constituents in the extract.

The result from this study showed significant statistical differences ($p > 0.05$) between groups after day 4, on the 7^{th} and 10^{th} day no significant statistical difference exists, and on the 13^{th} day there was a strong statistical difference. Although descriptive statistics showed reductions in wound lengths over time within each group, the differences on the 7th to after the 10th day between groups did not reach statistical significance. This study revealed that extract ointment of higher dose (2% JTE) exhibited a higher wound contraction ability compared to both control and the reference standard (1% SSD), which is consistent with the research conducted by Nithya, (2014) [23]. In this study we observed that the 2% JTE treated group has more effective percentage wound contraction from all other treated groups from the 4th, 7th and 10th day, it also has higher healing percentage of 91.33% on the 13th day slightly better than the standard drug. The 1% SSD and 1% JTE treated groups shows a comparable healing percentage from day 4, 7 and 10, while on the 13th day both groups revealed the same percentages wound contraction of 86.67%, this is in agreement with research conducted by Mohammed *et al.,* (2025) using *Acacia nolitica* pods extract, in which their result showed a significant difference between the control and treatment groups on days 3, 5, 7, 9, 11 and 13 ($P<0.05$) [24]. There was no significant difference in wound surface on the first day.

In this research we found out that the healing over time differed between treatment groups indicating the extract influenced healing speed differently across days. In this study only two comparisons were significantly different from the control; standard drug performed significantly better than control, and highest extract dose performed significantly better than control. The result

from this study showed that only the higher extract dose produced a statistically significant improvement comparable to the standard drug. Lower dose improved healing but not statistically significant, this is consistent with the study conducted by Abubakar *et al.,* (2025) [25].
The histological examination from this study revealed structures including epidermal regeneration, collagen fibers, fibroblast, epidermal layer, blood vessels, hair follicle, and granulation tissue. This result is relevant to the study conducted by Farahpour, *et al.,* (2018) [26], who used ostrich oil as a wound healing agent and found that there are significant increases in fibroblasts count, and collagen deposition in the ostrich-oil treated animals. The histopathological result of this study is in line with the findings of Shetty, *et al.,* (2006), which shows an improved epithelization, a more advanced stage of granulation tissue, and a well-organized collagen bundle formation in the treated groups [27]. Histological results from this study resembles a study conducted by Leon, *et al.,* (2020), which revealed that re-epithelization produced tissue closely resembling healthy skin, with well-formed collagen, regenerated hair follicles, and organized dermal cellularity [28]. The histopathological analysis of this study is relevant with a study conducted by Somboonwong, *et al.,* (2012), which revealed incomplete epithelialization in the untreated group, whereas extract-treated wounds exhibit more complete epithelialization and keratinization [29]. Also, this current study is in conformity with studies conducted by Mohammed *et al.,* (2025), Abubakar *et al.,* (2025) [24, 25]. The histological study by Weigert Hematoxylin and Van Gieson show much collagen deposition, regeneration of epidermal layer and fibroblast formation, which signifies the positive effect of *Jatropha tanjorensis* in wound healing, this is in line with the previous studies conducted by Mohammed *et al.,* (2025); Abubakar *et al.,* (2025) and Usman *et al.,* (2026) [25, 30], though the little variation is the plant extract used which are different with the current study.

CONCLUSION

The methanolic leaves extract of *Jatropha tanjorensis* revealed a moderate and dose-dependent wound healing properties. It shows much improvement in wound contraction, re-epithelization, angiogenesis, and collagen deposition, these could be attributed from the phytochemical constituents contained in the plant, also the antimicrobial activity of the plant, because antimicrobial agent plays a vital role in wound healing.

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AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

CONFLICT OF INTEREST

Authors have declared that no conflict of interest exist

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