

Evaluation Of Excision Wound Healing and Antioxidant Activity of *Lagerstroemia Speciosa* (L.) Pers (Lythraceae) Ethanolic Extracts of Leaf, Flower and Seed in Albino Wistar Rat

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ABSTRACT

An animal model was used in the present research to determine the ethanolic extract of *Lagerstroemia speciosa* efficacy to treat wounds. The use of plants as well- tolerated, safe and effective wound treatments is being extensively studied. The ethanolic leaf, flower and seed extracts of *L. speciosa* (LELE., LEFE, and LESE) have been subjected to a qualitative phytochemical analysis that identified a wide range of active metabolites like steroids, terpenoids, glycosides, polyphenolic compounds, amino acids, saponins, alkaloids, flavonoids, reducing sugars, tannins, and a number of others. The efficacy of *L. speciosa* ethanolic extracts to speed up healing wounds and act as antioxidants were examined. Male albino Wistar rats were provided with excision wounds that were then treated for 21 days with *L. speciosa* ethanolic extract. Povidone-iodine and Neomycin ointments were used as well as standard medicines for wound healing. The excision wound model studies showed that control rats experienced 84.5% to 92.3% wound contraction from day 17 to 21, while complete epithelization and healing occurred on day 24. Povidone-iodine and Neomycin standards treated rats showed 93.6% to 100% and 91.2% to 100% wound contraction, respectively. The topically applied LELE 2% treated groups had 88.8% to 92.6% wound contraction, while the LEFE 2% treated groups had 92% to 100% and 83.5% to 98.1%. The ethanolic flower extract of *L. speciosa* (LEFE 2%) showed significantly higher wound contraction.

Keywords: Excision wound, Neomycin, Povidone-iodine, Wound healing, Wound contraction.

INTRODUCTION

Wounds are physical injuries that cause disruptions in skin continuity, resulting in loss of tissue's defensive functions [1]. The wound healing process is complex and dynamic, involving haemostasis, inflammation, proliferation, and remodelling [2]. Antioxidants are postulated to control wound oxidative stress and accelerate healing [3, 4]. Wound infection results in the discharge of pus, which is an exudate formed by necrosis [5]. The body produces metabolic antioxidants, including endogenous ones like lipoid acid, glutathione, and transferrin [6, 7]. Antioxidant helps to minimize oxidative stress, and may delay wound healing as it occurs too frequently. Plant-

origin antioxidants are increasingly sought due to their potential therapeutic value and low side effects. Commonly used metabolites include phenolic compounds, carotenoids, and vitamins, which decrease oxidative damage in cells through direct or indirect reactions.

In India, medicinal plants are essential in the treatment of a variety of illnesses and for the vast majority of people, they are the only source of traditional medicine. At the moment, 25% of medications come from plants [8]. Herbal medicine has the advantage of having fewer side effects and costing less than synthetic medication. Numerous researches have examined the potential of different

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herbal medicines for wound treatment. Most of these natural remedies proved their effectiveness as an alternative treatment to the available synthetic drugs for the wound [9]. The Western Ghats are one of the rich biodiversity regions of India, especially Coimbatore in Tamil Nadu. *Lagerstroemia speciosa* (L.) Pers. (Family: Lythraceae) is commonly known as Queen's Flowers and Queen Crape Myrtle in English, Poomaruthu in Tamil, Manimaruthu in Malayalam. The active components of banaba leaf extract are arjunolic acid [8], ellagic acid, corosolic acid, and tannic acid [10]. A wide variety of phytochemical compounds, such as secondary metabolites, are synthesized by plants [11]. The secondary metabolites of medicinal plants have very strong anti-inflammatory properties and act as an efficient source of natural antioxidants [12].

The aim of the present study is, therefore, to find out: phytochemical and GC-MS analysis of ethanolic leaf, flower, and seed extracts of *L. speciosa*, To investigate the wound healing, antioxidant activities of ethanolic leaf, flower, and seed extracts of *L. speciosa* in albino rats.

MATERIALS AND METHODS:

Collection and authentication of plant samples:

The leaves, flowers, and seeds of *L. speciosa* were collected from the PG Girls Hostel, Government Arts College (Autonomous), Coimbatore District, Tamil Nadu, India. The *L. speciosa* were identified and authenticated at, Botanical Survey of India, Coimbatore-03 (No. BSI/ SRC/5/23/2020/Tech/51) and the voucher specimens were kept in the Department of Zoology, Government Arts College, Coimbatore-18.

Plant extracts preparation:

The collected samples of *L. speciosa* were carefully observed for any kind of disease or infection; the clean samples from those were isolated for the experiment. The selected plant parts were to be cleaned of dust and any other particles stuck to them. The samples were then kept under the shade at room temperature ($27\pm 2^{\circ}\text{C}$) for about 2 weeks until they were completely dry. The dried leaves were powdered with the help of a mixer grinder. Then, 100g of the powder was soaked in 1000 ml of ethanol solvent,

stored in an airtight bottle, and kept for 4 days with periodic shaking. The extract was then filtered using Whatman No. 1 filter paper and kept in Petridishes to dry at room temperature [13].

Phytochemical analysis:

The Horborne [14] and Trease and Evans [15] methodologies were used to perform the qualitative phytochemical analysis of selected parts of *L. speciosa* ethanolic extracts.

Experimental animals:

Healthy adult male Wistar albino rats (150-200 g) were used for this experiment. The animals were housed in standard metal cages in a room maintained at $22\pm 1^{\circ}\text{C}$ with an alternating 12-hour light and dark cycle. All the experimental procedures used in these studies were approved by the Institutional Animal Ethics Committee, KMCH College of Pharmacy, Coimbatore. (Approval No: KMCRET/ RERC/ Ph.D./23/ 2021).

Acute oral toxicity studies:

The leaves, flowers, and seeds of ethanolic extracts were orally fed to the experimental animal groups ($n=6$) in two different concentrations (1 and 2%), and they were observed to check for behavioural changes, if any, according to the OECD 425 protocol [16]. The toxicological study was done for 14 days to find out the mortality rate, if any. It was found to be safe, so the experiment was continued.

Skin irritation study:

The study involved albino rats with 150-200g dorsal hairs removed and kept separately. They received topically administered wound ointments, and their skin was evaluated for irritancy and sensitization. After seven days, they were examined for itching or swelling symptoms [17].

Preparation of ointments:

Gaur *et al.* [18] developed a basic ointment base using British Pharmacopoeia's formula, containing cetostearyl alcohol, hard paraffin, white soft paraffin, and wool fat. They used the extracted extract for 1% and 2% w/w and blended it into the base for uniform consistency and creamy texture. The ointment was



then transferred to a fresh container for skin application.

Excision wound creation:

The rats were fasted overnight; aesthetically ether administered, and laid down. The dorsum was depilated, and an excision wound was created using the Morton and Malone [19] technique. A square wound of 1.5 cm in width and 0.2 cm in depth was created, and bleeding stopped. The wound was left open.

Experimental design:

After wound creation, the animals were divided into 12 groups (6 rats per group).

Group I - Control animals received injury but did not receive any drug treatment

Group II - Animals received injury and treatment with Povidone-iodine

Group III - Animals received injury and treatment with Neomycin

Group IV - Animals received injury and received LELE orally

Group V - Animals received injury and treatment with LELE 1% w/w

Group VI - Animals received injury and treatment with LELE 2% w/w

Group VII - Animals received injury and received LEFE orally

Group VIII - Animals received injury and treatment with LEFE 1% w/w

Group IX - Animals received injury and treatment with LEFE 2% w/w

Group X - Animals received injury and received LESE orally

Group XI - Animals received injury and treatment with LESE 1% w/w

Group XII - Animals received injury and treatment with LESE 2% w/w

Wound healing activity:

On days 1, 3, 7, 11, 14, 17, and 21, the raw wound area was traced to examine the wound contraction. Photographs of the wounds were taken for the purpose of observing the growth of the wounds' surface area. All surgical procedures have been carried out under sterile circumstances. After the wound had been created for 24 hours, the commercially available ointments and the extract preparation ointment were applied to the area that was affected. Tracing wounds was carried out on transparency paper, both on the day of the injury and at scheduled times.

The formula below was used to calculate the percentage of wound contraction:

$$\text{Wound healing ratio (\% contraction)} = \frac{\text{Wound area on day 0} - \text{Wound area on day } n}{\text{Wound area on day 0}} \times 100$$

Where "n" is the number of measurement days (1st, 3rd, 7th, 11th, 14th, 17th, and 21st).

The significance of wound healing rate in test groups is determined by comparing corresponding days with control group healed areas.

Measurement of wound area:

Observations were made on post-wound days to determine wound contraction percentage. Wound areas were traced on paper, labelled, and measured using graph paper. Weight of each piece was used for milligrams measurement.

Haematological analysis:

Blood samples from Wistar rats were analysed for haematological parameters like platelet count, haemoglobin count, red blood cell count, white blood cell count, and differential count.

Biochemical analysis:

The animals experienced being killed, the dissection, and liver organ separation followed the experiment. The enzymatic and non-enzymatic antioxidant research studies were carried out on the liver organ.

The Lowry *et al.* [20] method was used to estimate total protein in tissue homogenate. Alkaline copper sulphate reagent and water were added, and optical



density measured at 640 nm. Protein amount was expressed as mg/g tissue or mg/dl.

The method of Kakkar *et al.* [21] was used to estimate SOD activity in tissue homogenate. Diluted water, reagents, and epinephrine were added, and the enzyme was determined. The reaction was started with 1.5 ml of buffer and 0.4 ml of epinephrine, and the SOD activity was expressed as U/mg.

The method of Sinha [22] was used to assay catalase activity in tissue homogenate. The reaction involved adding phosphate buffer and hydrogen peroxide, stopping the reaction with dichromate acetic acid reagent, and heating tubes in boiling water. The green colour was measured using a UV-VIS spectrophotometer.

Lipid peroxidation was estimated using Okhawa *et al.* [23] method, involving tissue homogenate, sodium dodecyl sulfate, acetic acid, and thiobarbituric acid. The pink colour intensity was measured and the concentration expressed as MDA per mg of protein.

The granulation tissue was dried at 50°C for 24 hours, and then hydrolysed for 24 hours on a boiling water bath. Neutralizing excess acid with 10N NaOH, the final hydrolysate was diluted to 20 mg/mL. The resulting hydrolysates were evaluated for hydroxyproline (HPR), hexosamine (HXA), and hexuronic acid (HUA) [24].

Histopathological analysis:

Histological processing involved examining granulation tissue and a specimen sample from rat skin, fixed in 10% formalin, and examining histological features under a light microscope.

Statistical analysis:

ANOVA and Dunnett's test were used to analyze data, with statistical significance calculated using mean \pm SEM. Data were statistically analyzed using software Graph pad Prism 5.0 version.

RESULTS:

Phytochemical analysis:

The qualitative phytochemical analysis revealed the following components (Table 1). *L. speciosa*

ethanolic leaf extract (LELE) contains alkaloids, flavonoids, saponins, phenols, tannins, protein and amino acids, reducing sugar, steroids, glycosides, phytosterols, coumarins, quinones. *L. speciosa* ethanolic flower extract (LEFE) contains alkaloids, flavonoids, saponins, phenols, tannins, protein and amino acids, reducing sugar, steroids, glycosides, phytosterols, coumarins, quinones. *L. speciosa* ethanolic seed extract (LESE) contains alkaloids, flavonoids, tannins, reducing sugar, steroids, glycosides, and phytosterols.

Toxicological studies:

The developed ointment was safer for the skin irritation test; the experimental animal exhibited no symptoms of edema, erythema, irritancy, or sensitization. Administration of *L. speciosa* at a dosage of 2000 mg/kg to rats throughout an acute toxicity test indicated no toxicity, mortality, or morbidity, and there were also no significant changes in behavior or gait.

Excision wound healing activity:

The excision wound model studies have indicated that the rate of wound contraction in control rats ranged from 84.5% to 92.3% from day 17 to day 21, while complete epithelization and healing were observed on day 24. The Povidone-iodine and Neomycin standards standard-treated rats showed standards in wound contraction of 93.6% to 100% and 91.2% to 100% on days 17 to 21, respectively. The topically applied LELE 2% treated groups had a rate of wound contraction 88.8% to 92.6%, and the LELE (500mg/kg) oral administered group had a rate of wound contraction 89.8% to 98.5% ($P < 0.05$) on days 17 to 21st day. The topically applied LEFE 2% treated groups had a rate of wound contraction of 92% to 100%, and the LEFE 1% treated groups had 83.5% to 98.1%. Similarly, the LEFE (500 mg/kg) oral administered group had a rate of wound contraction ranging from 73.3% to 98.2% ($P < 0.05$) from the 17th day to the 21st day. The topically applied LESE 2% treated groups had a rate of wound contraction 88.4% to 96.7%, and the LESE (500 mg/kg) oral administered group had a rate of wound contraction 89.5% to 98.3% ($P < 0.05$) at 17 to 21 days. Among the three samples, the ethanolic flower extract of *L.*



speciosa (LEFE 2%) had significantly higher wound contraction (Table 2).

Antioxidant activity:

The Antioxidant content of the experimental plant *L. speciosa* ethanol leaf extract contains Total protein higher in 2% of Leaf extracts (0.611 ± 0.0143) compared to standard groups. The experimental groups IV, VII, and X were orally treated with 500mg/kg ethanolic leaf, flower, and seed extract. The leaf extract showed the highest rate of Catalase (0.532 ± 0.044). Total protein, SOD, Catalase, and LPO were moderately lower in all the groups of ethanolic extracts in the flower-treated group. The experimental plant with ethanolic Seed extracts of 2%

shows the highest content of LPO (0.403 ± 0.0143) (Table 3).

Estimation of connective tissue parameters:

Wound healing can be anticipated through the estimation of connective tissue parameters like hydroxyproline, hexosamine, and hexuronic acid. In contrast to both the standard group and the control group, the leaf possessed a higher HXA level in LELE 1% (116 ± 4.16), the Flower were having a higher HPR level in LEFE 2% (76.4 ± 4.87), a higher HXA level in LEFE 2% (129 ± 2.13), a higher HUA level in LEFE 2% (51.5 ± 1.76), and the Seed was a higher HXA level in LESE 1% (116 ± 8.27) (Table 4).

Table. 1: Phytochemical analysis of ethanolic leaf, flower and seed extracts of *Lagerstroemia speciosa*

<i>Phytoconstituents</i>	<i>Leaf extract</i>	<i>Flower extract</i>	<i>Seed extract</i>
Alkaloids	++	+++	+++
Flavonoids	++	+++	+
Saponins	+++	+++	—
Phenols	+++	+++	—
Tannins	+++	+++	+
Protein and Amino acids	+++	+++	—
Reducing sugar	+	+++	+++
Steroids	++	++	+
Glycosides	+	++	++
Phytosterols	++	+++	+
Quinones	+	+++	—
Coumarins	++	++	—

‘+’ indicates the presence of Phytoconstituents

‘-’ indicates the absence of Phytoconstituents

‘++’ indicates the Phytoconstituents present in a moderate level

‘+++’ indicates the Phytoconstituents present abundantly.



Table. 2: Wound contraction rate of ethanolic leaf, flower and seed extract of *Lagerstroemia speciosa*

Groups	Only Wound	Wound + PI	Wound+ Neomycin	Wound + LELE (P.O)	Wound+ LELE 1%	Wound+ LELE 2%	Wound+ LEFE (P.O)	Wound+ LEFE 1%	Wound+ LEFE 2%	Wound+ LESE (P.O)	Wound+ LESE 1%	Wound +LESE 2%
3 rd day	10.9 ±6.21	5.48 ±8.42 ^{ns}	10.1 ±9.75 ^{ns}	8.92 ±10.5 ^{ns}	13.9 ±2.67 ^{ns}	19.13 ±7.9 ^{ns}	6.12 ±9.25 ^{ns}	16.33 ±10.7 ^{ns}	14.03 ±12.81 ^{ns}	14 ±15.67 ^{ns}	12.4 ±5.64 ^{ns}	10.6 ±3.68 ^{ns}
7 th day	22.2 ±2.35	13.6 ±1.37 ^{ns}	32.8 ±8.76 ^{**}	16.4 ±13.28 ^{ns}	18.6 ±12.48 ^{ns}	20 ±11.35 ^{ns}	23.8 ±9.87 ^{***}	22.9 ±5.68 ^{ns}	27.4 ±2.45 ^{ns}	33.83 ±15.77 ^{**}	22.9 ±9.29 ^{***}	32.6 ±2.5 ^{**}
11 th day	71.23 ±2.84	82.7 ±2.79 ^{**}	83.3 ±3.55 ^{**}	55.43 ±3.35 ^{ns}	60.6 ±0.79 ^{ns}	66.9 ±6.34 ^{ns}	63.1 ±8.53 ^{ns}	55.5 ±0.70 ^{ns}	77.5 ±3.30 [*]	63.23 ±10.91 ^{ns}	48.5 ±3.06 ^{ns}	47.2 ±3.63 ^{ns}
14 th day	78.4 ±4.30	89.6 ±1.58 ^{**}	87.7 ±3.77 ^{**}	84.8 ±2.67 [*]	70.83 ±5.77 ^{ns}	77 ±2.23 ^{ns}	68.73 ±5.78 ^{**}	70.63 ±2.65 ^{ns}	89.9 ±2.36 ^{**}	80.4 ±3.61 ^{***}	80.5 ±2.09 ^{***}	68.5 ±2.26 ^{ns}
17 th day	84.5 ±1.58	93.6 ±0.9 ^{**}	91.2 ±1.49 ^{**}	89.8 ±1.98 ^{ns}	79.9 ±5.54 ^{ns}	88.8 ±2.08 ^{ns}	73.33 ±5.12 ^{**}	83.5 ±4.5 ^{ns}	92 ±1.08 ^{**}	89.5 ±2.78 ^{ns}	84.8 ±6.8 ^{ns}	88.4 ±0.45 ^{ns}
21 st day	92.3 ±1.78	100±0 ^{**}	100±0 ^{**}	98.5 ±0.57 ^{**}	90.9 ±0.72 ^{ns}	92.6 ±4.26 ^{ns}	98.2 ±0.64 ^{**}	98.1 ±1.10 ^{**}	100±0 ^{**}	98.3 ±1.7 ^{**}	90.3 ±3.7 ^{ns}	96.7 ±1.30 [*]

Values are expressed as the mean ± SEM; Statistical significance (P) calculated by one way ANOVA followed by Dunnett's test, ns- no significant, ***P< 0.001,

**P < 0.05, *P < 0.01 calculated by comparing control group with all treated groups.

Table. 3: Antioxidant activity of ethanolic leaf, flower and seed extract of *Lagerstroemia speciosa*

Groups	Only Wound	Wound+ PI	Wound+ Neomycin	Wound+ LELE (P.O)	Wound+ LELE 1%	Wound+ LELE 2%	Wound+ LEFE (P.O)	Wound+ LEFE 1%	Wound+ LEFE 2%	Wound+ LESE (P.O)	Wound+ LESE 1%	Wound+ LESE 2%
Total Protein (mg/dl)	0.318± 0.0347	0.803± 0.021 ^{***}	0.876± 0.0521 ^{***}	0.526± 0.025 ^{ns}	0.594± 0.0432 ^{**}	0.611± 0.0143 ^{ns}	0.468± 0.0454 ^{ns}	0.51± 0.0214 ^{ns}	0.461± 0.129 ^{ns}	0.352± 0.0536 ^{ns}	0.366± 0.0411 ^{ns}	0.424± 0.154 ^{ns}
SOD (Unit/min/ mg protein)	0.198± 0.00643	0.475± 0.0277 ^{***}	0.497± 0.0158 ^{***}	0.378± 0.0337 [*]	0.333± 0.0238 ^{ns}	0.324± 0.0329 ^{ns}	0.293± 0.0109 ^{ns}	0.34± 0.0375 ^{ns}	0.35± 0.0418 ^{ns}	0.38± 0.0325 [*]	0.348± 0.0542 ^{ns}	0.39± 0.09 [*]
CAT	0.244± 0.0287	0.842± 0.0386 ^{***}	0.76± 0.0367 ^{***}	0.532± 0.044 ^{ns}	0.499± 0.0434 ^{ns}	0.523± 0.0387 ^{ns}	0.407± 0.068 ^{ns}	0.366± 0.0416 ^{ns}	0.393± 0.0655 ^{ns}	0.421± 0.0715 ^{ns}	0.513± 0.16 ^{ns}	0.392± 0.0807 ^{ns}



(μmol of H_2O_2 consumed/min/ mg protein)												
LPO (nmol of MDA/ mg protein)	0.112 \pm 0.00503	0.269 \pm 0.0122 ^{ns}	0.345 \pm 0.125 ^{ns}	0.331 \pm 0.0756 ^{ns}	0.338 \pm 0.105 ^{ns}	0.397 \pm 0.081 ^{ns}	0.397 \pm .138 ^{ns}	0.35 \pm 0.073 ^{ns}	0.36 \pm 0.0429 ^{ns}	0.386 \pm 0.1 ^{ns}	0.312 \pm 0.0709 ^{ns}	0.403 \pm 0.0143 ^{ns}

Values are expressed as the mean \pm SEM; Statistical significance (P) calculated by one way ANOVA followed by Dunnett's test, ns- no significant, ***P< 0.001,

**P < 0.05, *P < 0.01 calculated by comparing control group with all treated groups.

Table. 4: Determination of connective tissue parameters of ethanolic leaf, flower and seed extract of Lagerstroemia speciosa

Groups	Only Wound	Wound+ PI	Wound+ Neomycin	Wound+ LELE (P.O)	Wound+ LELE 1%	Wound+ LELE 2%	Wound+ LEFE (P.O)	Wound+ LEFE 1%	Wound+ LEFE 2%	Wound+ LESE (P.O)	Wound+ LESE 1%	Wound+ LESE 2%
Hydroxyproline ($\mu\text{g}/\text{mg}$ of protein)	42.7 \pm 0.64	80.8 \pm 0.99 ^{***}	43.9 \pm 0.482 ^{ns}	66.3 \pm 4.92 [*]	45.1 \pm 1.95 ^{ns}	56.4 \pm 2.16 ^{ns}	69.1 \pm 0.907 [*]	40.8 \pm 0.853 ^{ns}	76.4 \pm 4.87 ^{**}	41.4 \pm 1.02 ^{ns}	75.4 \pm 2.82 ^{**}	49.4 \pm 4.04 ^{ns}
Hexosamine ($\mu\text{g}/\text{mg}$ of protein)	83.1 \pm 0.895	127 \pm 5.51 ^{***}	91.5 \pm 0.568 ^{ns}	89.2 \pm 2.3 ^{ns}	116 \pm 4.16 ^{***}	90.6 \pm 0.637 ^{ns}	121 \pm 1.25 ^{***}	80.6 \pm 1.23 ^{ns}	129 \pm 2.13 ^{***}	87.9 \pm 2.81 ^{ns}	116 \pm 8.27 ^{***}	87.9 \pm 4.85 ^{ns}
Hexuronic acid ($\mu\text{g}/\text{mg}$ of protein)	17.7 \pm 0.543	58.9 \pm 1.97 ^{***}	26.8 \pm 1.74 ^{ns}	29.9 \pm 3.47 ^{ns}	49.6 \pm 0.554 ^{***}	47.9 \pm 0.787 ^{***}	45.1 \pm 2.84 ^{***}	22.4 \pm 2.28 ^{ns}	51.5 \pm 1.76 ^{***}	25.2 \pm 0.929 ^{ns}	40.7 \pm 8.95 ^{***}	28.1 \pm 5.24 ^{ns}

Values are expressed as the mean \pm SEM; Statistical significance (P) calculated by one way ANOVA followed by Dunnett's test, ns- no significant, ***P< 0.001,

**P < 0.05, *P < 0.01 calculated by comparing control group with all treated groups.



DISCUSSION

The inflammatory phase, proliferation phase, and maturation phase collectively form the dynamic wound healing process [25]. Botanical identification, phytochemical screening, and content standardization involve quality control using ethanol as a solvent, as bioactive component, including tannins, flavonoids, and phenolic compounds, have homeostatic effects. Whole plant extracts, including *L. speciosa*, contain therapeutic chemicals like antioxidants, antimicrobials, inflammation medications and re-epithelialization agents. Tannins, flavonoids, triterpenoids and sesquiterpenes are also known to promote the wound-healing process mainly due to their astringent and antimicrobial property, which seems to be responsible for wound contraction and increased rate of epithelialisation [26].

Polyphenols particularly tannins, flavonoids are well known natural antioxidants [27]. The experimental plant shows the presence of the polyphenols in the phytochemical analysis. The antioxidant content of the experimental plant *L. speciosa* ethanol leaf extract contains Total protein higher in 2% of leaf extracts (0.611 ± 0.0143) compared to standard groups. The experimental groups IV, VII, and X were orally treated with 500mg/kg ethanolic leaf, flower, and seed extract. *L. speciosa* seeds contain phytol compounds with anti-inflammatory and anti-allergic properties, including furfural, which suppresses inflammation in wounds. The migration of leucocytes is inhibited by the tannins' anti-inflammatory property. Plant hormones, including cytokinins, auxins, terpenes, carotenoids, and ethylene derivatives, are found in small quantities in plants. The presence of tannins suggests the ability of this plant to play a major role in the treatment infectious diseases [28].

The positive effects of medicinal plants on wound healing are able to be explained through a number of mechanisms, include regulation of wound healing, reduction of bacterial count, improvement of collagen deposition, supplementation of fibroblasts and fibrocytes, etc. Catalase concentrations found highest in the leaf extract (0.532 ± 0.044). For glycosides, only ethanol extract showed a favourable response. It was found the glycosides shown more action than quercetin. Medicinal plants accelerate up wound healing, promote blood clotting, and fight infection to

treat wounds. The highest wound healing result is in Group XI contain LEFE 2% shows 100% and the Standard Group II and Group III contain PI & Neomycin and it shows 100% result in wound healing. The Group XI and Group V show the least healing and it contains lowest in LESE 1% (90.3 ± 9.7) and LELE 1% (90.9 ± 3.52). Medicinal plants and active compounds help to decrease the inflammation. Keratinocytes, the majority of epidermis cells, produce keratin and create the epidermal water barrier ceased [29, 30]. Macrophages are crucial for wound healing, phagocytosing bacteria and debris, and secreting collagenases and elastases[31]. Natural cytokinins include isopentenyladenine, zeatin, and dihydrozeatin. Wound contraction in rats was found to be 84.5% to 92.3% from days 17-21, with complete epithelization and healing occurring on days 24. Povidone-iodine and Neomycin standard treatments showed 93.6% to 100%, while *L. speciosa* LEFE 2% ethanolic flower extract showed significantly more contraction. Flavonoids, found in the test plant, can enhance wound healing by boosting tissue remodelling and acting as proangiogenic agents. The present study provides enough scientific support for the pharmacological use of *L. speciosa* as a medicinal plant used for various diseases. Further research needed to identify additional mechanisms.

CONCLUSION:

The study evaluated the wound healing activity of an ethanolic extract of *L. speciosa* in an animal model. The extracts contained steroids, terpenoids, glycosides, polyphenolic compounds, amino acids, saponins, alkaloids, flavonoids, reducing sugars, tannins, and other active metabolites. The extracts were screened for wound healing and antioxidant activity. Results showed that topical application of *L. speciosa* ethanolic extract showed better wound healing than orally treated and control groups. The ethanolic extract's efficacy as a wound healing agent and therapeutic agent for external wounds is suggested.

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Ethics Committee of KMCH College of Pharmacy, Coimbatore (Approval No: KMCRET/ReRc/Ph.D/23/ 2021).

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