INTERNATIONAL JOURNAL OF RESEARCH CULTURE SOCIETY
Monthly Peer-Reviewed, Refereed, Indexed Journal
Volume - 9, Issue - 6, June - 2025
ISSN(O): 2456-6683
[Impact Factor: 9.241]
IJRCS

DOIs:10.2017/IJRCS/202506005 --:-- Research Paper / Article / Review

Comparative evaluation of wound healing properties of *Calotropis gigantea* and *Carica papaya* latex in the development of bioactive wound healing gauze

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Abstract: A wound is disruption of normal skin integrity caused by physical, chemical and biological factors. Wound healing is a complex biological process involving tissue repair and regeneration. Traditional wound dressings provide basic protection but often lack bioactive properties that actively promote healing. Medicinal plants have been widely used for their therapeutic potential including wound healing. *Calotropis gigantea* and *Carica papaya* are well known for their bioactive compounds. Which contribute to accelerated wound healing. This study focuses on the comparative evaluation of the wound healing properties of *Calotropis gigantea* and *Carica papaya* latex and their incorporation into bioactive wound healing gauze. Latex from both plants was collected and analyzed for phytochemical composition, antioxidant properties, anti-inflammatory effects and antimicrobial activity. Characterization techniques such as UV-Visible spectroscopy and FTIR analysis were used to identify functional groups responsible for their bioactivity. The latex was then incorporated into a gauze dressing and tested for antimicrobial effectiveness against wound pathogens. The resulting wound healing gauze provides a safer and more effective approach to wound management. Comparative analysis of *Calotropis gigantea* and *Carica papaya* latex extracts are both possess significant wound healing properties, with differences in antioxidant, anti-inflammatory, and antimicrobial activities. The findings indicate that both *Calotropis gigantea* and *Carica papaya* latex significantly contribute to wound healing by enhancing tissue regeneration , Reducing microbial infections and accelerating wound contraction. The development of latex infused wound dressings provides a natural, cost effective alternative to conventional wound care products.

Key Words: Wound healing, *Calotropis gigantea* and *Carica papaya,* Latex, antimicrobial, bioactive gauze, phytochemicals.

1. INTRODUCTION

A wound is any damage to the skin caused by injuries such as cuts, burns and pressure varying from minor abrasions to deep lacerations and healing involves complex processes like inflammation, tissue repair and regeneration. Chronic wounds such as diabetic foot ulcers and pressure sores affect millions of people worldwide, leading to both physical pain and high healthcare costs. Traditional dressings offer basic protection but lack bioactive properties that actively enhance the healing process(1). In this study developed natural, cost effective alternatives using plant derived bioactive compounds. Medicinal plants like *Calotropis gigantea* and *Carica papaya* produce latex rich in bioactive compounds that used in wound healing. About 10% of flowering plants produce latex was carried out from ten plant species from nanded region for presence of secondary metabolites(2). Latex, a milky fluid secreted by ducts of laticiferous tissue and flow inside laticifers including leaves, stems, fruits and roots of some plants, Contains a variety of bioactive compounds(3)(4), including proteolytic enzymes, flavonoids, alkaloids, and antimicrobial agents(5), which help accelerate wound closure and prevent infections(6). Both plants such as *Calotropis gigantea* and *Carica papaya* have antimicrobial, antioxidant, and anti-inflammatory properties. Making it effective in preventing infections and accelerating wound closure. Given their potential, both *Calotropis gigantea* and *Carica papaya* latex extracts are ideal

candidates for the development of bioactive wound dressings.This study aims to compare the wound healing properties of both plants latex and incorporate them into a bioactive wound healing gauze. Then the latex infused into gauze and tested for antimicrobial test against common wound pathogens. This study aims to provide an innovative cost effective alternative to conventional wound care products.

2. METHODOLOGY

Collection of plant Materials

Calotropis gigantea and Carica papaya were collected from Tirupur district, Tamil Nadu,India (Latitude 11.110695, Longitude 77.348045). The Taxonomical identification of plants such as Calotropis gigantea and Carica papaya were authenticated by Department of Botany, LRG Government College for Women, Tirupur.

Extraction of plant Materials

The latex extracts of Calotropis gigantea and Carica papaya was collected aseptically(7),diluted with distilled water in the ratio of 1:1, and stored at 4ºC.It was then centrifuged at 5000 rpm for 20 minutes at 25ºC to separate the polyisoprene precipitate, and it was stored. To preserve bioactive compounds, the supernatant was lyophilized at -170ºC to -180ºC, and the dry latex powder was stored at 4ºC. For ethanolic extraction, one gram of lyophilized powder was mixed with 150 ml ethanol, stirred at 50ºC(8), filtered, and stored for further use.

Phytochemical Screening

The phytochemical screening of the ethanolic extracts of *Calotropis gigantea* and *Carica papaya* latex extracts were performed qualitatively for the presence of Tannins, alkaloids, steroids, saponins, terpenoids, glycoside, phenol, quinones, proteins, carbohydrates, flavonoids, iodine alkaloids using standard procedures(9).

Antimicrobial activity

The antimicrobial activity of latex extracts were evaluated against Escherichia coli, pseudomonas sp., Staphylococcus aureus, Candida sp., and Aspergillus sp., using the agar well diffusion method. Test organisms were spread onto agar plates, and wells were filled with different concentrations of the extracts (25, 50, 75, and 100 µL). The plates were incubated at 37ºC for 24 hours. After incubation, the formation of clear zones around the wells indicated the antimicrobial effect of the extracts.

Anti Inflammatory Assay

The Anti inflammatory test was carried out by 2 set of 10 test tubes with 0.1 to 1ml of Bovine Serum Albumin(BSA) as a standard and Calotropis gigantea and Carica papaya latex extracts was also added then 4.78ml of phosphate buffer solution was added in each tubes then measured by calorimetry in 680nm.

Antioxidant Assay

DPPH method of Antioxidant activity was carried out by using 30ml of methanol with pinch of DPPH and it is incubated in dark for 15 minutes for activation. Then 2 set of 6 tubes were taken and 100µl to 500µl of sample was

added in 5 tubes and one tube was serve as blank. To this 3ml of DPPH solution was added to all the tubes including blank after that tubes were incubated in dark for 30 minutes and is was measured by calorimetry in 580nm

$$\frac{\text{Radical scavenging activity}}{\text{Inhibition \%}} = \frac{\text{Ab-As}}{\text{Ab}} * 100$$

UV-Visible Spectroscopy Analysis

Scan the sample extract over a range of wavelengths (typically 200-700 nm) to identify absorption peaks, which correspond to the specific bioactive compounds in the extract. Record the absorbance at different wavelengths and analyze the spectra for characteristic peaks, which can be used to identify the presence and concentration of various phenolic components.

FTIR Spectrum Analysis

The FTIR spectrum was used to identify the functional groups of active compounds by analysing the peak values in the infrared radiation region. The analysis of the Calotropis gigantea and carica papaya latex extracts revealed the presence of various functional groups,including hydroxyl (-OH), carbonyl (C=O), alkenes (C=C), alkanes (C=C), ethers (C-O), and nitro compounds (N-O). These functional groups were identified by their characteristic peaks.

Development of wound healing gauze

For wound healing gauze development the cotton gauze was taken and sterilized using soaking in ethanol. The sterilized gauze was soaked overnight in *Calotropis gigantea* and *Carica papaya* latex extract then dried in hot air oven. The process was carried out for three days and the developed gauze was obtained.

Antimicrobial activity of latex infused gauze

The organisms used against the gauze were *Escherichia coli, Staphylococcus aureus, Pseudomonas* sp., *Aspergillus* sp., *Candida* sp., AATCC test method 147 was carried out for the developed *Calotropis gigantea* and *Carica papaya* latex extract coated gauze. The coated and uncoated wound gauze was cut into 5*1cm (length*breath) and placed on a plate and incubated at 37ºC for 24 hours. The zone of inhibition was observed and recorded.

3. RESULTS

Processing of *Calotropis gigantea* and *Carica papaya* latex extract

Calotropis gigantea and *Carica papaya* were collected from natural habitats in Tirupur region, the latex extracs of both plants were collected then used for extraction process.

Qualitative analysis of phytochemical analysis

The latex extracts containing Tannins, Alkaloids, Steroids, Saponins, phenol, Proteins and Flavonoids gives positive results for *Calotropis gigantea* and Tannins, Saponins, Flavonoids gives positive results for *Carica papaya* (Figure 1). Similar results were observed in(10).

Figure 1: Phytochemical analysis of latex extracts

s.no	Phytochemical constituents	*Calotropis gigantea*	*Carica papaya*
1	Tannins	+	+
2	Saponins	+	+
3	Steroids	+	_
4	Terpenoids	_	_
5	Glycoside	_	_
6	Phenol	_	_
7	Alkaloids	+	_
8	Quinones	+	_
9	Proteins	+	_
10	Flavonoids	+	+
11	Carbohydrates	_	_
12	Iodine alkaloids	_	_

'+'indicates presence ' _' indicates absence

Antimicrobial activity for plant latex extract

The antimicrobial activity was carried out for the *Calotropis gigantea* and *Carica papaya* latex extracts, with the organisms of *Escherichia coli*, *Staphylococcus aureus, Pseudomonas* sp., *Aspergillus* sp., and *Candida* sp., well diffusion method was used in extract and the zone of inhibition were observed(Figure 2).Similar results were observed and the zone of inhibition formed using ethanol extracts of *Calotropis gigantea* and *Carica papaya* (11)

Figure 2: Antimicrobial activity of latex extracts

Organism	*Calotropis gigantea* latex extract				*Carica papaya* latex extract			
	25µl	50µl	75µl	100µl	25µl	50µl	75µl	100µl
Escherichia coli	22mm	22mm	21mm	22mm	17mm	20mm	18mm	21mm
S. aureus	23mm	22mm	23mm	23mm	23mm	23mm	24mm	24mm
Pseudomonas sp.,	23mm	25mm	21mm	22mm	NIL	18mm	16mm	NIL
Aspergillus sp.,	10mm	10mm	11mm	11mm	18mm	18mm	16mm	18mm
Candida sp.,	18mm	19mm	19mm	20mm	NIL	NIL	NIL	10mm

Anti inflammatory assay

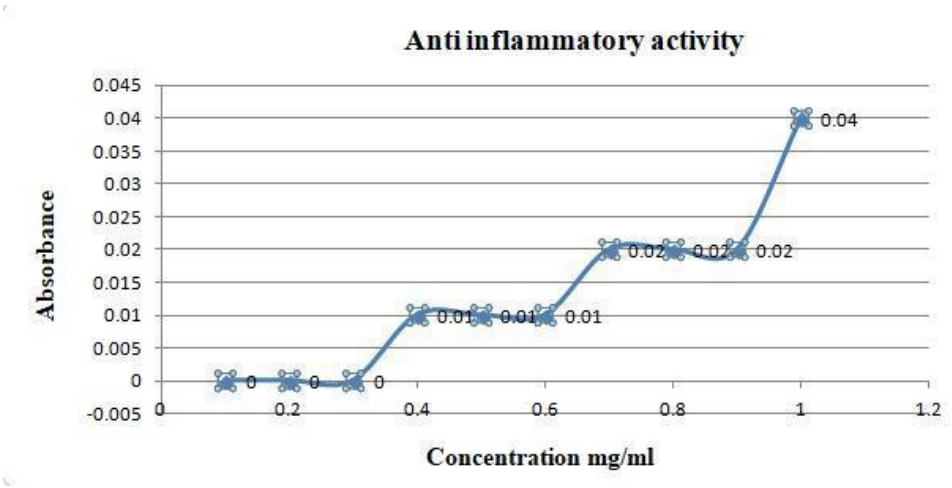
The protein denaturation method was utilized to measure the anti-inflammatory properties of the extract obtained from *Calotropis gigantea* and *Carica papaya* latex extracts. Both the latex extract has the Anti inflammatory properties which was confirmed by this test, increasing value of Anti inflammatory results were observed depends upon the sample.Similar findings were reported by (12), These results suggest that *Calotropis gigantea* and *Carica papaya* could serve as a natural anti-inflammatory agent, potentially aiding in wound healing by reducing inflammation(Figure 3) and (Figure 4).

Anti-inflammatory analysis for carica papaya latex extract

CONCENTRATION (µl)	ABSORBANCE (620nm) OF SAMPLE
0.1	0.00
0.2	0.00
0.3	0.00
0.4	0.01
0.5	0.01
0.6	0.01
0.7	0.02
0.8	0.04
0.9	0.02
1.0	0.02

ISSN(O): 2456-6683
[Impact Factor: 9.241]

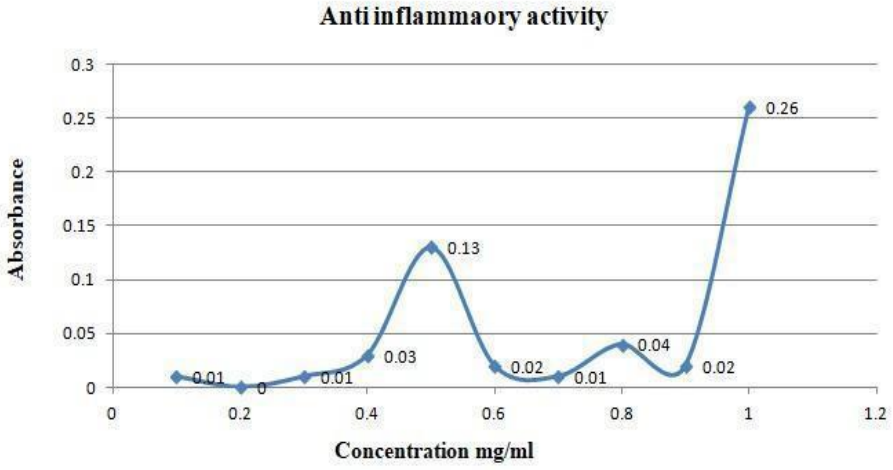
Figure 3: Anti-inflammatory assay for *Carica papaya* plant latex extract



Anti-inflammatory analysis for Calotropis gigantea latex extract

CONCENTRATION (µl)	ABSORBANCE (620nm) OF SAMPLE
0.1	0.01
0.2	0.00
0.3	0.01
0.4	0.03
0.5	0.13
0.6	0.02
0.7	0.01
0.8	0.04
0.9	0.02
1.0	0.26

Anti-inflammatory assay for Calotropis gigantea latex extract



Antioxidant assay

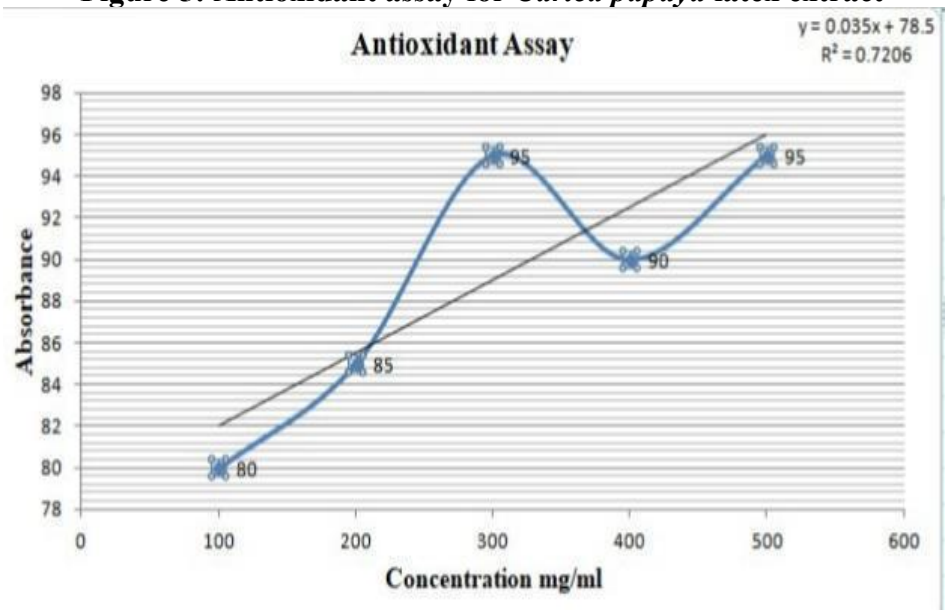
ISSN(O): 2456-6683
[Impact Factor: 9.241]

The Antioxidant assay is carried out by DPPH Assay, this test was used here to recognise the Antioxidant properties in the *Calotropis gigantea* and *Carica papaya* latex extracts. Depending upon the increasing amount of extract with DPPH solution the Antioxidant activity was also upgraded.Similar results were reported by (13). These results suggest that *Calotropis gigantea* and *Carica papaya* may help in reducing oxidative stress, which is crucial for wound healing(Figure 5) and (Figure 6).

Antioxidant analysis of carica papaya latex extract

CONCENTRATION	CONTROL ABSORBANCE AT 580 nm	SAMPLE ABSORBANCE AT 580 nm	%RSA	IC 50
100	0.20	0.04	80	
200	0.20	0.03	85	
300	0.20	0.01	95	
400	0.20	0.02	90	
500	0.20	0.01	95	

Figure 5: Antioxidant assay for *Carica papaya* latex extract



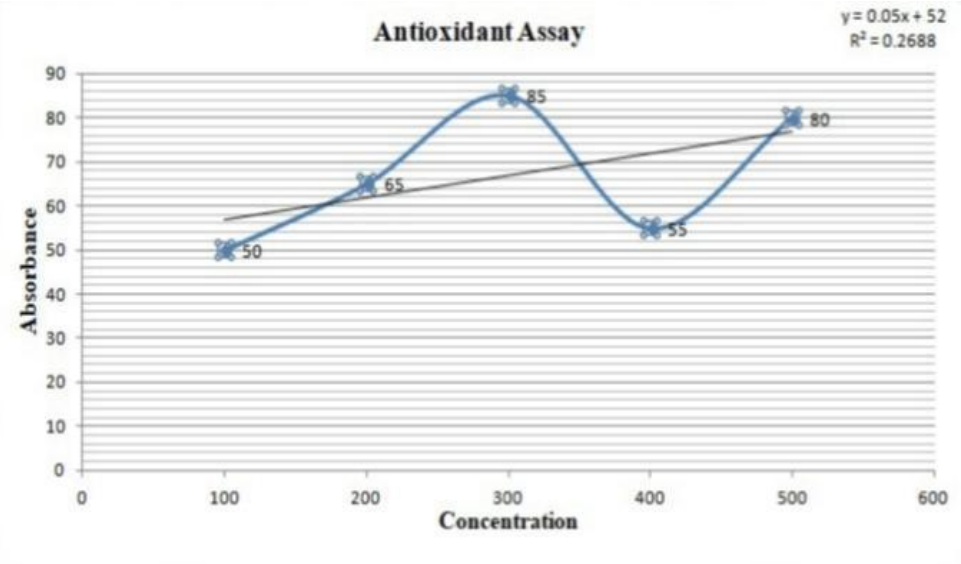
Antioxidant analysis of calotropis gigantea latex extract

CONCENTRATION	CONTROL ABSORBANCE AT 580 nm	SAMPLE ABSORBANCE AT 580 nm	%RSA	IC 50
100	0.20	0.10	50	
200	0.20	0.07	65	
300	0.20	0.03	85	
400	0.20	0.09	55	

ISSN(O): 2456-6683
[Impact Factor: 9.241]

500	0.20	0.04	80	

Figure 6: Antioxidant assay for *Carica papaya* latex extract



UV Spectroscopy for *Calotropis gigantea* and *Carica papaya* latex extract

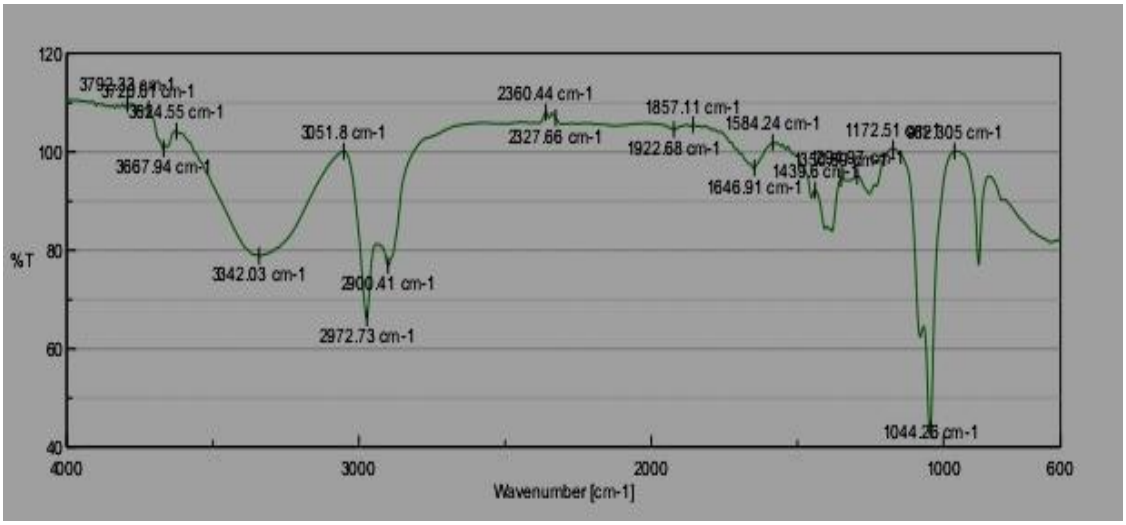
The Spectroscopic method has become a powerful tool for secondary metabolite profiling as well as for qualitative and quantitative analysis of the pharmaceutical and biological material. The spectroscopy was characterized for the *Calotropis gigantea* and *Carica papaya* plant latex extracts.The peaks were observed in the wavelength of 350-700 nm.The UV Spectroscopy analysis of *Calotropis gigantea* and *Carica papaya* latex extracts revealed the presence of bioactive compounds such as flavonoids, tannins.

FTIR Spectrum analysis

The *Calotropis gigantea* and *Carica Papaya* latex extract was analysed using FTIR to separate the functional groups based on their peak ratios. The results of the analysis confirmed the presence of several functional groups including Alcohol, Methane, Alkane, Alkene, Carbonyl, Acetylene, Nitrile, and Ammonia compounds. In *Calotropis gigantea* latex extract revealed the presence of various functional groups were identified by their corresponding peaks at 1044.26 cm^{-1},1172.51 cm^{-1},1294.97 cm^{-1} ,1352.89 cm^{-1},1439.6 cm^{-1},1584.24 cm^{-1},1646.91 cm^{-1},1857.11 cm^{-1},1922.68 cm^{-1},2900.41 cm^{-1},3624.55 cm^{-1}.In *Carica papaya* latex extract revealed the presence of various functional groups were identified by their characteristic peaks at 1037.52 cm^{-1},1083.81 cm^{-1} ,1271.82 cm^{-1},1323.89 cm^{-1},1449.24 cm^{-1},1742.37 cm^{-1},2334.44 cm^{-1},2360.44 cm^{-1}. Similar peaks were observed from (14)(15).

FTIR Spectrum analysis for sample calotropis gigantea latex extract

ISSN(O): 2456-6683
[Impact Factor: 9.241]

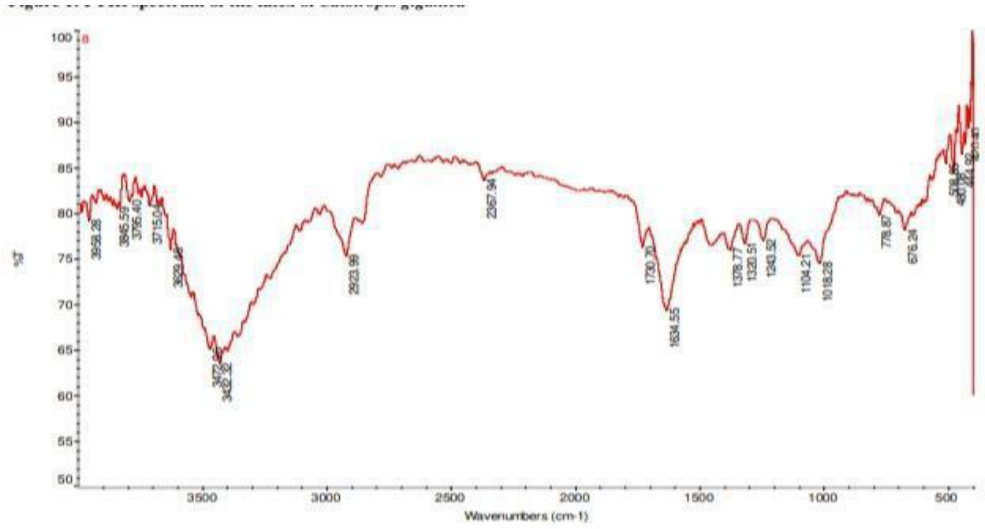


FTIR Spectrum analysis for standard carica papaya latex extract

Peak	Standard peak	Bond strength	Functional group	Compounds
Peak 1	772.29cm^{-1}	Strong	C-Cl	Chloro group
Peak2	1072.31cm^{-1}	Strong	C-O	Carbonyl group
Peak3	1167.65cm^{-1}	Medium	C-O	Carbonyl group
Peak4	1376.37cm^{-1}	Medium	C-H,CH3 C-H	Methine group, methyl group,
Peak5	1465.58cm^{-1}	Medium	C-H,CH3 C-H	Methine group, methyl group,
Peak6	1739.94cm^{-1}	Weak	C=O	Carbonyl group
Peak7	2851.90cm^{-1}	Weak	C-H	Methine group
Peak8	2921.70cm^{-1}	Strong	C=H	Methyl group

FTIR Spectrum analysis for standard calotropis gigantea latex extract

ISSN(O): 2456-6683
[Impact Factor: 9.241]



FTIR spectrum analysis of the Calotropis gigantea latex extract

Peak	Standard peak	Bond strength	Functional group	Compound
Peak 1	1018.28cm^{-1}	Strong	C-O	Carbonyl group
Peak 2	1104.21cm^{-1}	Strong	C-H,C-O,C-C C=O	Methine group, carbonyl group, alkene group
Peak 3	1243.54cm^{-1}	Medium	C=H	Methyl group
Peak 4	1320.51cm^{-1}	Medium	C=H	Methyl group
Peak 5	1378.77cm^{-1}	Medium	C=H	Methyl group
Peak 6	1634.55cm^{-1}	Medium	C=O	Carbonyl group
Peak 7	1730.70cm^{-1}	Strong		Carbonyl group
Peak 8	2923.99cm^{-1}	Weak	CH3,CH2	Methyl group, methylene group
Peak 9	3432.32cm^{-1}	Weak	N-H	Amino group
Peak 10	3472.99cm^{-1}	Strong	N-H	Amino group
Peak 11	3629.48cm^{-1}	Strong	O-H	Hydroxyl group

Development of wound healing gauze

The cotton gauze soaked in *Calotropis gigantea* latex extract was in pale yellow colour and the cotton gauze soaked in *Carica papaya* latex extract was in white colour. Those gauzes were obtained at the end of the three days process.

Antimicrobial activity in developed gauzes

The *Calotropis gigantea* latex extract and *Carica papaya* latex extract coated gauzes was taken to antimicrobial activity against *Escherichaia coli, Staphylococcus aureus, Pseudomonas sp ., Aspergillus* sp., and *Candida* sp., AATCC 147 test method was used in prepared gauzes.The similar approach was reported by (6).

The *Carica papaya* latex extract coated gauze gives enhanced antimicrobial activity than *Calotropis gigantea* latex extract coated gauze alone. It shows that *Carica papaya* latex extract incorporated gauze is effectively works on wounds.

Figure7: Antimicrobial activity for latex extracts coated gauze

Organisms	***Calotropis gigantea***	***Carica papaya***
Escherichia coli	3mm	1.5mm
Pseudomonas	+	1.1mm
S.aureus	+	+
Candida	+	+
Aspergillus	+	2 mm

4. CONCLUSION

Calotropis gigantea and *Carica papaya* plants latex were collected and ethanolic extraction was obtained. Phytochemical analysis was observed, Anti inflammatory activity was checked using PBS and BSA method, antioxidant activity was checked using DPPH method, UV Spectroscopy and FTIR Spectroscopy performed to analyse the bioactive compounds and functional groups. antimicrobial activity of *Calotropis gigantea* and *Carica papaya* latex extracts and developed gauze against *Escherichia coli, Staphylococcus aureus, Pseudomonas sp., Aspergillus sp., and Candida* sp ., was performed. In this study comparision of the individual wound healing properties of *Calotropis gigantea* and *Carica papaya* latex extracts provides valuable insights. They develop a natural latex infused gauze dressing. The gauze serves as an effective and natural alternative for wound care, promoting faster healing, reducing infection rates, providing an eco-friendly, cost-effective solution, A comparative study of both lattices determines their opimal formulation, leading to the development of a scientifically validated wound care product. In further study to comparison between commercial and prepared gauze has limited to be done.

REFERENCES :

1. Butler, M. S. (2004). The role of natural product chemistry in drug discovery. Journal of Natural Products, 67(12), 2141–2153.

2. Agrawal, A. A., & Konno, K. (2009). Latex: A model for understanding mechanisms, ecology, and evolution of plant defense against herbivory. Annual Review of Ecology, Evolution, and Systematics, 40, 31–331.
3. Balandrin, M. F., Klocke, J. A., Wurtele, E. S., & Bollinger, W. H. (1985). Natural plant chemicals: Sources of industrial and medicinal materials. *Science, 228*(4704), 1154–1160.
4.Pickard, W. F. (2008). Laticifers & secretory ducts: Two other tube systems in plants. New Phytologist, 177(4), 877–888.
4. Pandey, B. P. (2001). Plant anatomy (6th rev. ed.). S. Chand and Company Ltd.
5. Hagel, J. M., Yeung, E. C., & Facchini, P. J. (2008). Got milk? The secret life of laticifers. Trends in Plant Science, 13(12), 631–639.
6. Aworh, O. C., Kasche, V., & Apampa, O. O. (1994). Purification and properties of Sodom apple latex proteinases. Food Chemistry, 50(4), 359–362.
7. Altemimi, A., Lakhssassi, N., Baharlouei, A., Watson, D. G., & Lightfoot, D. A. (2017). Phytochemicals: Extraction, isolation, and identification of bioactive compounds from plant extracts. Plants, 6(4), 42.
8. Harborne, J. B. (1984). Phytochemical methods (2nd ed.). Chapman and Hall.
9. Saratha, V., & Subramanian, S. P. (2010). Antioxidant properties of Calotropis gigantea latex. International Journal of Pharmaceutical Sciences and Research, 1, 88. [Include issue number if available]
10. Sultana, B., Anwar, F., & Ashraf, M. (2009). Effect of extraction solvent/technique on the antioxidant activity of selected medicinal plant extracts. *Molecules, 14*(6), 2167–2180.
12.Mesquita, M. L., Desrivot, J., Bories, C., Fournet, A., Paula, J. E., Grellier, P., et al. (2005). Antileishmanial and trypanocidal activity of Brazilian Cerrado plants. Memórias do Instituto Oswaldo Cruz, 100(8), 783–787.
11. Oliveira, J. S., Costa-Lotufo, L. V., Bezerra, D. P., Alencar, N. M., Marinho-Filho, J. D., Figueiredo, I. S., et al. (2010). In vivo growth inhibition of sarcoma 180 by latex proteins from Calotropis procera. Naunyn-Schmiedeberg's Archives of Pharmacology, 382(2), 139–149.
12. Ramamurthy, N., & Kannan, S. (2007). Fourier transform infrared spectroscopic analysis of a plant (Calotropis gigantea Linn) from an industrial village, Cuddalore dt, Tamil Nadu, India. Romanian Journal of Biophysics, 17(4), 269–276.
13. Tagg, T. R., Dajani, A. S., & Wannamaker, L. W. (1976). Bacteriocins of Gram-positive bacteria. *Bacteriological Reviews, 40*(3), 722–756.
14. Jaswal, P., AgyaPreet, A., Simran, S., & Goel, G. (2017). Antimicrobial activity of herbal treated cotton fabric. *International Research Journal of Engineering and Technology (IRJET), 4*(7).