TITLE: WOUND HEALING PROPERTY OF LEMONGRASS (*Cymbopogon citratus)* FORMULATED AS TOPICAL CREAM IN GUINEA PIGS

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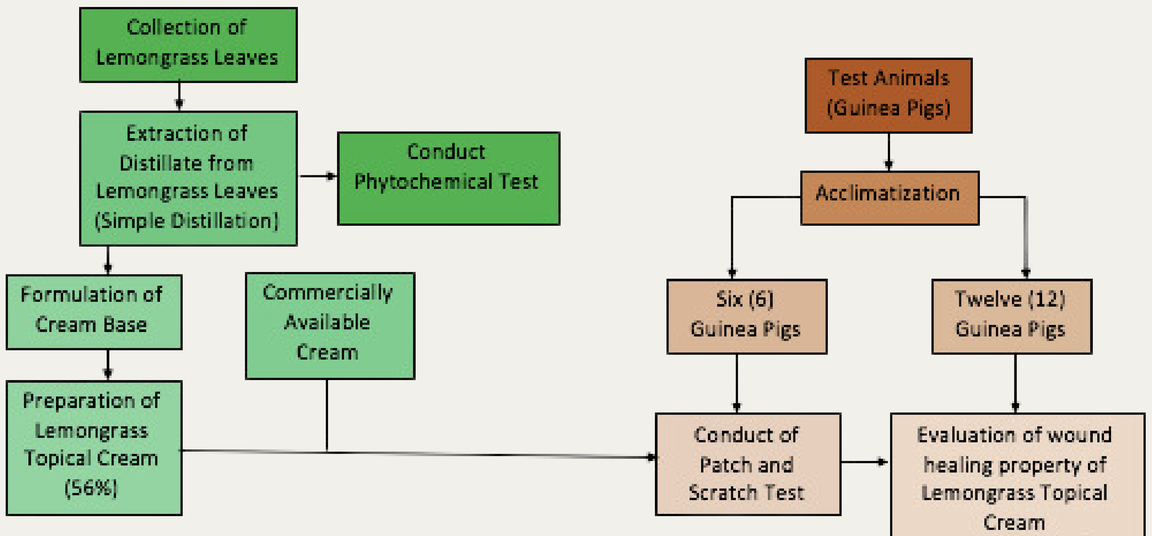
BACKGROUND OF THE PROBLEM

The researchers' interest made the decision to create a topical cream utilizing Cymbopogon citratus because most of the marketed treatments for wounds available in the market are in different dosage forms. Therefore, the researchers formulated a topical cream since it can be easily applied and absorbed on the skin. Hence, this study was conducted to investigate the wound healing properties of Lemongrass formulated as topical cream and test its efficacy and potential as a topical medication to treat wounds.

OBJECTIVE OF THE STUDY

The researchers aim to investigate the healing properties of Lemongrass plant extract to test its efficacy and potential as a topical medication to treat linear abrasion wounds.

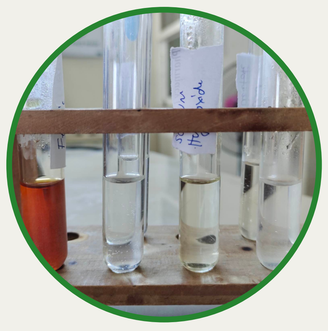
METHODS



FINDINGS

Table 1. Phytochemical Analysis Result of the Lemongrass Distillate

Test	Positive Result	Obtained Result
Alkaloids		
Mayer's Test	Formation of yellow precipitate	(-)
Wagner's Test	Formation of reddish or brown precipitate	(-)
Dragendorff's Test	Formation of red precipitate	(-)
Hager's Test	Formation of yellow precipitate	(-)
Phenols		
Ferric Chloride Test	Formation of bluish to black color	(-)
Tannins		
Gelatin Test	Formation of white precipitate	(+)
Flavonoids		
Alkaline Reagent Test	Formation of yellow fluorescence	(+)
Lead Acetate Test	Formation of yellow precipitate	(+)



All tests conducted to confirm the presence of alkaloid and phenols showed no positive result, therefore, the extracted lemongrass leaves do not contain both alkaloids and phenols. However, the test conducted to confirm the presence of tannins and flavonoids showed positive results confirming that the extracted lemongrass leaves contains tannins and flavonoids which helps in promoting wound healing.

Table 2. Results of Patch Test to Determine the Safety Profile of Lemongrass Topical Cream

Guinea Pigs	After 24 hours	After 72 hours	Average Scores	Interpretation
	Lemongrass Topical Cream	Lemongrass Topical Cream		
1	0	0	**0**	**No erythema**
2	0	0	**0**	**No erythema**
3	0	0	**0**	**No erythema**

Legend: 0 - No edema, 1 - Very slight edema, 2 - Well-defined edema, 3 - Moderate to severe edema, 4 - Severe edema

The table shows the erythema results for Patch Test at 24 and 72 hour intervals. The average erythema score was zero (0), indicating that no persistent erythema was found in any of the three guinea pigs used.

Table 3. Results of Scratch Test to Determine the Safety Profile of Lemongrass Topical Cream

Guinea Pigs	After 24 hours	After 72 hours	Average Scores	Interpretation
	Lemongrass Topical Cream	Lemongrass Topical Cream		
1	0	0	**0**	**No edema**
2	0	0	**0**	**No edema**
3	0	0	**0**	**No edema**

Legend: 0 - No erythema, 1 - Very slight erythema, 2 - Well-defined erythema, 3 - Moderate to severe erythema, 4 - Severe erythema

The table shows the results of each Scratch Test, with no edema formation after applying the formulated Lemongrass Topical Cream and cold cream and observing at 24 and 72 hour intervals. The average score for each guinea pig was zero (0), therefore, the safety profile of Lemongrass Topical Cream shows no signs of edema when applied to the skin of the guinea pig.

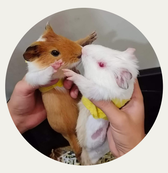


Table 4. One-Way ANOVA Result for Wound Healing Response in terms of Epithelialization Time (days)

The significant differences ($p<0.05$) lie between the positive control group (Commercially Available Cream) and negative control group (Cold Cream) and also lies between the control treated group (Lemongrass Topical Cream) and the negative control group (Cold Cream). This implies that epithelialization was significantly faster in the commercially available cream and Lemongrass topical cream than the cold cream.

Source	SS	df	MS	F	p-value
Treatment	9.50	2	4.750	15.55	0.0012
Error	2.75	9	0.306		
Total	12.25	11			

Table 5. Histological Examination Results in terms of the given parameters that indicate Wound Healing

	Re-epithelialization	Neovascularization	Granulation Tissue Amount	Granulation Tissue Fibroblast Maturation	Acute inflammation
CG 1	2	2	1	3	1
CG 2	2	2	1	3	0
CG 3	2	1	1	3	1
CG 4	2	1	1	3	0
PG 1	3	1	1	3	0
PG 2	2	1	1	3	0
PG 3	3	1	1	3	0
PG 4	3	1	1	3	0
NG 1	3	1	1	3	1
NG 2	0	1	1	3	0
NG 3	3	1	1	3	1
NG 4	2	2	1	3	0

Legend: PG = Positive Control Group (Mupirocin), NG = Negative Control Group (Cold Cream), CG = Control Treated Group (Lemongrass Topical Cream)

The application of the formulated Lemongrass topical cream and the positive control using mupirocin cream, shows there is no significant difference with the re-epithelialization and presence of granulation tissue. Furthermore, with application of the formulated Lemongrass topical cream, the table shows there are few acute inflammatory infiltrates which are expected to disappear in due time. As compared to negative control, the table shows a slower regeneration process of re-epithelialization with one of the test subjects having no sign of re-epithelialization.

Table 6. Epithelialization Time (days) of Wound Given Treatment

The positive control group had the least number of days until the scab fell off, and the negative control group had the greatest number of days. The control treated group which received the formulated Lemongrass Topical Cream comes in between the positive control group and negative control group. Among the three treatments, the positive control group has the fastest wound healing response based on epithelialization time, followed by the Lemongrass Topical Cream.

	Test Animal No. 1	Test Animal No. 2	Test Animal No. 3	Test Animal No. 4	Mean
Control Treated Group	4	3	4	4	3.8
Positive Control Group	4	3	3	4	3.5
Negative Control Group	5	6	6	5	5.5

Legend: Control Treated Group = Lemongrass Topical Cream, Positive Control = Commercially Available Cream (Mupirocin), Negative Control = Cold Cream

RECOMMENDATIONS

1. Future researchers should discover other indications of Lemongrass to treat other wounds such as burn wounds.
2. Future researchers should use lemongrass oil, not the extract.
3. Future researchers should use other parts of Lemongrass for its wound healing property.
4. Future researchers should discover if other drug formulation is possible for Lemongrass.
5. Further researchers should evaluate and improve the aesthetic characteristics of Lemongrass Topical Cream, such as color, smell, consistency, etc. to improve overall satisfaction.

CONCLUSION

The researchers have concluded that the formulated Lemongrass Topical Cream has wound healing properties and can be used to treat abrasion wounds in Guinea Pigs.