COMPARATIVE STUDY OF THE WOUND HEALING POTENTIAL OF INSULINUM 30, PHOSPHORIC ACID 30, AND SYZYGIUM JAMBOLANUM 30 IN A DIABETIC RAT MODEL

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Abstract: Diabetes mellitus leads to delayed wound repair as a result of sustained hyperglycemia, microvascular impairment, neuropathy, increased oxidative stress, and dysregulated inflammatory processes. Chronic non-healing wounds, particularly diabetic foot ulcers, are a major cause of morbidity and substantially increase the risk of infection and limb amputation.The present study aimed to assess and compare the wound healing efficacy of Insulinum 30, Phosphoric acid 30, and Syzygium jambolanum 30 in streptozotocin-induced diabetic albino rats. Diabetes was experimentally induced in male albino rats using streptozotocin. An excision wound model was adopted, and the animals were randomly allocated into four groups: control (glibenclamide-treated), Insulinum 30, Phosphoric acid 30, and Syzygium jambolanum 30. Evaluation parameters included wound area measurement, percentage of wound contraction, duration of epithelization, hydroxyproline and protein content, tensile strength, blood glucose levels, and histopathological examination of wound tissue. All three homoeopathic remedies exhibited significant wound healing effects when compared with the control group. Among them, *Syzygium jambolanum* 30 produced the most rapid wound contraction, a reduced epithelization period, and favorable biochemical outcomes.The study offers experimental evidence that *Syzygium jambolanum* 30 has the most pronounced wound healing potential under diabetic conditions, followed by *Insulinum* 30 and *Phosphoric acid* 30. These results substantiate the traditional application of these remedies in the management of diabetic wounds and highlight the need for further clinical evaluation.

Index Terms **- Diabetes mellitus, wound healing, Insulinum, Phosphoric acid, Syzygium jambolanum, homoeopathy**

1. INTRODUCTION

Diabetes mellitus (DM) is a metabolic condition that gradually impairs people's health and quality of life all over the world. Malfunctioning beta cells in the pancreas cause diabetes mellitus by decreasing the quantity of insulin generated and/or increasing peripheral tissue resistance to the effects of insulin. This initially reduces glucose tolerance and may eventually result in more severe symptoms[1]. Over 500 million people are thought to have diabetes mellitus (DM) at the moment, and this number is expected to rise dramatically in the years to come. Furthermore, according to one estimate, one in three to one in five diabetics will experience a chronic non-healing sore at some point in their lives, such as a diabetic foot ulcer (DFU). These wounds have a startling recurrence rate (40 percent within a year and 65 percent within five years), and there are currently no reliable ways to predict when they could recur[2]. One in three to one in five diabetics are expected to develop a diabetic foot ulcer (DFU) or another chronic non-healing sore at some point in their lives. There are currently no accurate methods to anticipate when these wounds can reoccur, and their shocking recurrence rate is 40% within a year and 65% within five years3. Numerous biological reactions, including acute inflammation, cellular proliferation, and contraction of the collagen lattice that forms, are involved in the mechanics of wound healing[3].Using homeopathy is one easy technique to address the various problems that arise during wound healing. Numerous medications created using homeopathic principles have been demonstrated to aid in the healing of wounds. Syzigium Jumbolanum, phosphoric acid, and insulinum For diabetic situations, all of these homoeopathic remedies are extremely popular. Diabetes will hinder the healing of wounds. Thus, this study will allow us to evaluate the wound-healing properties of insulin, phosphoric acid, and Syzigium jumbolanum[7].

2. NEED OF THE STUDY

Chronic hyperglycemia can cause neuropathy, decreased leukocyte function, elevated oxidative stress, microvascular and macrovascular problems, and delayed wound healing. For a cutaneous wound to heal as best it can, the intricate biological and molecular processes of cell migration and proliferation, as well as the deposition and remodeling of extracellular matrix, must be carefully synchronized[4,5]. Research indicates that syzigium, phosphoric acid, and insulinum are homoeopathic treatments that effectively manage diabetes and exhibit wound healing action in diabetic situations[7,8]. In the current era of evidence-based research, I would like to demonstrate the ability of insulin, phosphoric acid, and syzigium jumbolanum to cure wounds in streptozotocin- induced diabetic albino rats and compare how these three medications work.

3. RESEARCH METHODOLOGY

3.1 SELECTION OF SAMPLES

White male albino rates, 150-250g in weight.

3.2 STUDY SETTING

There were twenty-four male wistar albino rats used in the investigation. streptozotocin-induced wound following the induction of diabetes, and the rats were divided into four groups, each consisting of six animals.

3.3 STUDY DESIGN:

This is an experimental study done on wound healing actitivity of insulinum 30, phosphoric acid 30 and syzijium jumbolanum 30 in strptozotcin induced diabetic albino rats.

3.4 ANIMAL ALLOTMENT

- **Group I (Control):** Glibenclamide with topical soft paraffin
- **Group II:** Insulinum 30 with topical soft paraffin
- **Group III:** Phosphoric acid 30 with topical soft paraffin
- **Group IV:** Syzygium jambolanum 30 with topical soft paraffin

3.6 OUTCOME ASSESSMENT

Wound healing was assessed by measuring:

- Wound area and percentage of wound contraction
- Period of epithelization
- Hydroxyproline content
- Protein content
- Tensile strength of healed tissue[5,6]

3.7 OBSERVATION AND RESULT GROUP 1 GLIBENCLAMIDE

Day 4 Day 8 Day 20 Day 24 Day 32

GROUP 2 INSULINUM 30

DAY 4 DAY 8 DAY 12 DAY 16 DAY 20

GROUP 3 ACID PHOSPHORICUM 30

Day 4 Day 8 Day 12 Day 16 Day 20

GROUP 4 SYZIJIUM JUMBOLANUM 30

DAY 1 DAY 8 DAY 12 DAY 16

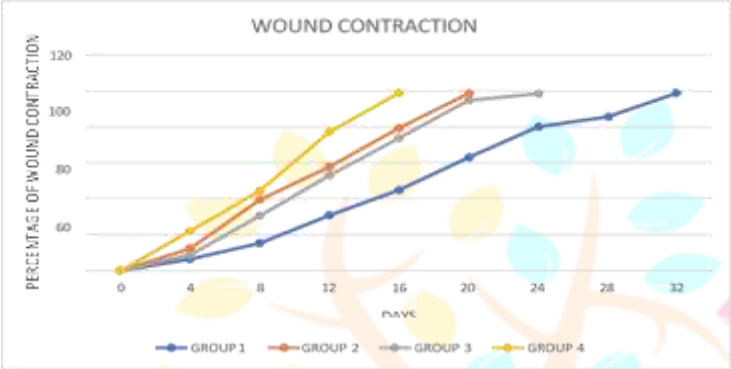
4. STATISTICAL ANALYIS

WOUND CONTRACTION

Descriptives								
Wound_Contraction								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Group 1	48	52.7210	32.45823	4.68494	43.2962	62.1459	3.46	98.94
Group 2	30	57.1457	30.65683	5.59715	45.6982	68.5931	10.81	98.71
Group 3	36	60.7236	32.93460	5.48910	49.5801	71.8671	8.88	98.59
Group 4	24	60.2296	30.39022	6.20338	47.3969	73.0622	20.91	98.99
Total	138	57.0764	31.69262	2.69786	51.7416	62.4112	3.46	98.99

ANOVA					
Wound_Contraction					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1628.162	3	542.721	.535	.009
Within Groups	135977.711	134	1014.759		
Total	137605.873	137			

CHART 1

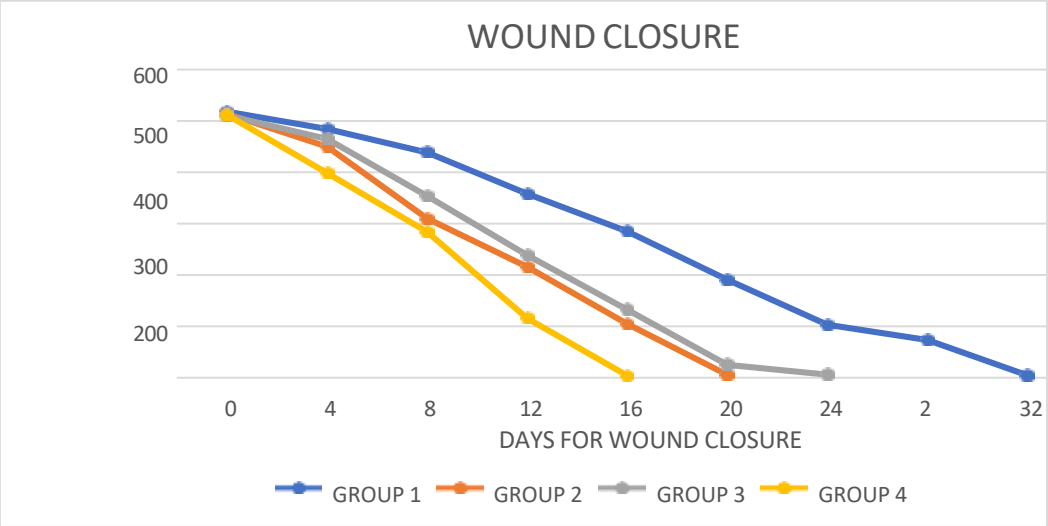


WOUND CLOSURE

Descriptives								
Wound_Closure								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Group 1	54	273.1107	178.34753	24.27002	224.4312	321.7902	5.48	518.99
Group 2	36	267.9792	180.55781	30.09297	206.8872	329.0711	6.62	514.38
Group3	42	245.4852	190.78208	29.43831	186.0334	304.9371	7.20	513.86
Group 4	30	265.3213	186.92683	34.12801	195.5217	335.1210	5.14	513.72
Total	162	263.3657	182.32299	14.32465	235.0773	291.6542	5.14	518.99

ANOVA					
Wound_Closure					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	19436.975	3	6478.992	.192	.002
Within Groups	5332472.347	158	33749.825		
Total	5351909.322	161			

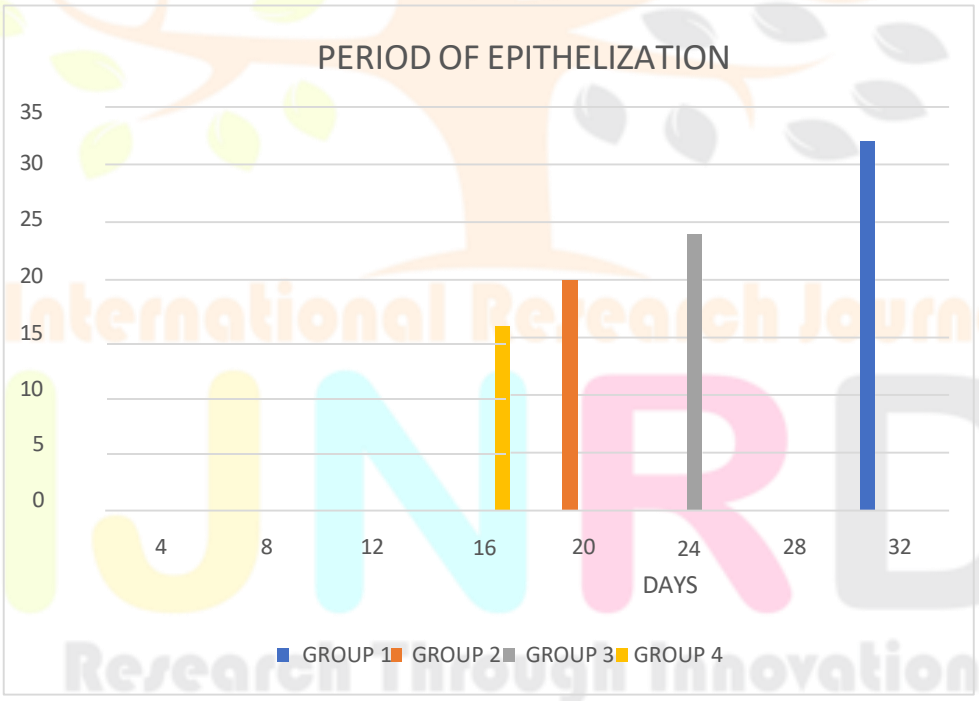
CHART 2



PERIOD OF EPITHELISATION

RAT	GROUP 1	GROUP 2	GROUP 3	GROUP 4
1	DAY 32	DAY 22	DAY 25	DAY 16
2	DAY 33	DAY 21	DAY 24	DAY 17
3	DAY 34	DAY 21	DAY 24	DAY 16
4	DAY 33	DAY 21	DAY 24	DAY 16
5	DAY 34	DAY 21	DAY 24	DAY 16
6	DAY 34	DAY 21	DAY 24	DAY 16

CHART 3



HYDROXYPROLIN CONTENT

	GROUP 1	GROUP 2	GROUP 3	GROUP 4
DAY	33	20	24	16
HYDROXY-PROLIN CONTENT	3.86 ± 0.34 µg/100 mg	5.9 ± 0.54 µg/100 mg	5.8 ± 0.45 µg/100 mg	6.86 ± 0.64 µg/100 mg

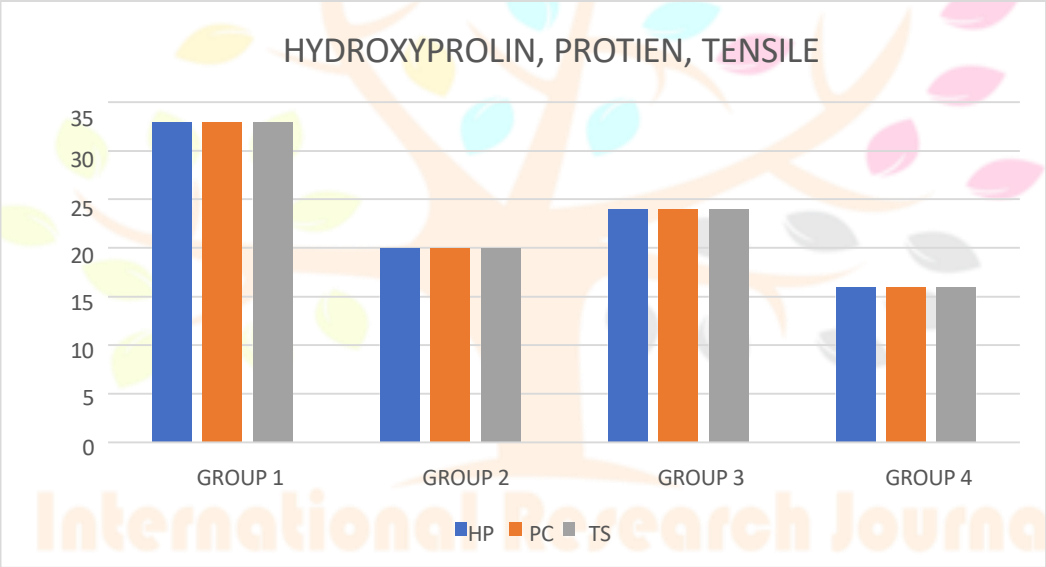
PROTEIN CONTENT

	GROUP 1	GROUP 2	GROUP 3	GROUP 4
DAY	33	20	24	16
PROTIEN CONTENT(Mg/100mg tissue)	5.86 ± 0.4	7.9 ± 0.5	8.8 ± 0.6	9.86 ± 0.7

TENSILE STRENGTH

	GROUP 1	GROUP 2	GROUP 3	GROUP 4
DAY	33	20	24	16
TENSILE STRENGTH	150-250g	200-300g	150-250g	250-350g

CHART 4



5. RESULT

Compared to the control group, all treatment groups displayed increasing wound contraction. The earliest and greatest percentage of wound contraction was shown by Syzygium jambolanum 30, which was followed by Insulinum 30 and Phosphoric acid 30. In the Syzygium jambolanum group, the epithelization period was considerably shortened. Increased collagen synthesis and tissue regeneration were indicated by biochemical measures like protein content and hydroxyproline in the treated groups. Additionally, the Syzygium jambolanum group's healed wound had better tensile strength.

6. DISCUSSION

Syzigium, phosphoric acid, and insulinum are homoeopathic remedies that successfully treat diabetes, according to study findings. It also demonstrates wound healing function in diabetic conditions. In the current era of evidence-based research, I would want to show how insulinum 30, phosphoric acid 30, and Syzigium jumbolanum 30 may heal wounds in streptozotocin-induced diabetic albino rats and compare the mechanisms of action of these three drugs. In streptozotocin-induced diabetic albino rats, the current study aims to assess the potential of homeopathic drugs, namely Insulinum 30, Phosphoric acid 30, and Syzigium Jumbolanum 30, to facilitate wound healing. The effectiveness of wound healing in streptozotocin-induced diabetic albino rats was investigated using homoeopathic remedies such as insulinum 30, phosphoric acid 30, and Syzigium jambolanum 30. One of the primary effects of diabetes mellitus is impaired wound healing, which can lead to significant morbidity, an increased risk of infection, an extended hospital stay, and in rare cases, amputation.

Neuropathy, decreased leukocyte function, elevated oxidative stress, microvascular and macrovascular issues, and delayed wound healing are all consequences of chronic hyperglycemia. The animals were kept in cages with usual diet pellets and water. Twenty-four albino rats weighing between 150 and 250 grams were used for this study. Six rats were given to each of the four

groups. Glibenclamide was given orally to diabetic rats with excision wounds after streptozotocin-induced diabetes (group 1). Soft paraffin (0.25 gm) and homoeopathic drugs Insulinum 30 (group 2), Phosphoric acid 30 (group 3), and Syzijium Jumbolanum 30 (group 4) were used to administer 900 µg/kg as a powder, dissolved in 5 ml of distilled water, and applied externally at intervals of 6-7 hours. The study found that Syzijium Jumbolanum significantly alters wound closure, epithelization, protein content, and tensile strength3 and has a high efficacy in wound healing activities. Compared to the glibenclamide and syzijium groups, Group I took a lot longer to heal the wound. While the syzijium group healed in 16 days, the glibenclamide group took 32 days. After Syzijium, Insulinum 30 (group 2) shows a faster recovery in wound closure. It took 24 days for Group 3's acid phos 30 to heal the wound. The Syzijium jumbolanum 30group not only healed wounds but also more accurately cleaned the granulation tissue in terms of tensile strength, protein content, hydroxyprolin content, and epithelization. Insulinum 30 and acid phos 30 were developed after syizijium.

7. CONCLUSION

The finest illustration of this idea is the study's use of highly diluted, potentized homoeopathic medications, such as Insulinum 30, Phosphoric Acid 30, and Syzygium jambolanum 30, which worked non-toxically and without side effects to hasten the healing of diabetic wounds. The treatments used in this study, such as phosphoric acid for diabetic fatigue and tissue degradation, insulin for controlling glucose metabolism, and Syzygium jambolanum for its long-standing use in diabetes therapy, were chosen not only for local symptoms but also for their known systemic effects. Together, the research shows that the homoeopathic approach and Hahnemann's aphorisms may respect both the optimal mode of cure and the entirety of symptoms, resulting in a really therapeutic response, even in complicated situations like diabetic wound healing.[10] In streptozotocin-induced diabetic albino rats, the study

showed the efficacy of homoeopathic medications Insulinum 30, Phosphoric acid 30, and Syzigium Jumbolanum 30 in wound healing. At $p \leq 0.05$, the findings were deemed statistically significant. Additionally, Syzijium jumbolanum shown efficacy in wound healing activity in the diabetic state when compared to insulinum 30, acid phos 30, and Syzijium jumbolanum 30. The variations discovered in this study allow us to offer some suggestions for the design of prospective future investigations, such as the need to carefully regulate experimental settings that could affect the response and increase the variability of experiment outcomes.

8. ETHICAL STATEMENT

This study was carried out in strict compliance with ethical guidelines and principles to safeguard the welfare and well-being of the animals involved. Ethical approval was obtained from IAEC of The Dale view college of pharmacy and research centre bearing approval No. 1118/PO/Re/S/07/CPCSEA, following a comprehensive review and evaluation of the study methodology.

9. ACKNOWLEDGMENT

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