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FORMULATION AND EVALUATION OF NEOMYCIN SULPHATE OINTMENT CONTAINING NATURAL WOUND HEALING AGENT CURCUMA LONGA

Bagmar Bhagyesh Hemant*1, Lad S.D.*2, Dr. Garje S.Y.*3, Dr. Sayyed G.A.*4

*1,2,3,4SAJVPM's College Of Pharmaceutical Science And Research Centre, Kada, Ashti, Beed, Maharashtra, India.

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ABSTRACT

The aim of this study was to develop a new ointment formulation utilizing the natural wound healing properties of curcuma longa, which has been recognized for its wound healing and antibacterial properties. Combining neomycin sulphate with curcuma longa is a sound approach, as curcuma longa enhances the wound healing effects of neomycin sulphate synergistically. Formulations were prepared with a fixed concentration of neomycin sulphate (0.5%) and varying concentrations of curcuma longa (3%, 4%, and 5%). The formulations were evaluated for their antibacterial activity, rheology, stability, spreadability, and other physical characteristics to assess their efficacy. The results were promising, with the formulation containing neomycin sulphate (0.5%) and 5% curcuma longa demonstrating superior performance compared to the other formulations.

I. INTRODUCTION

A wound is characterized as the disruption or damage to cellular and structural integrity of living tissue. The extensive body of literature on wound healing primarily focuses on the skin, which, being the most exposed organ, constantly faces insults and injuries from the environment. Wound healing is essentially a response of connective tissue. It begins with an acute inflammatory phase, followed by the synthesis of collagen and other extracellular substances, which are subsequently rearranged to form scar tissue. The process of wound healing entails a complex interplay among epidermal and dermal cells, the extracellular matrix, controlled growth of blood vessels, and plasma-derived proteins, all regulated by a variety of cytokines and growth factors. Traditionally, this dynamic process is divided into three overlapping phases: inflammation, proliferation, and remodeling. Natural substances play a role in facilitating wound healing, promoting collagen production, and accelerating the healing process. In this study, Neomycin sulfate, an aminoglycoside antibiotic, was chosen for its availability and suitability for accurate estimation under laboratory conditions. Neomycin sulfate works by binding to the bacterial 30S ribosomal subunit, disrupting protein synthesis crucial for bacterial growth. It was combined with Curcuma longa powder, known for its reported antibacterial and anti-inflammatory properties, which complement the wound healing process. The readily available nature of Curcuma longa, its cost-effectiveness, and its potential to reduce microbial resistance to neomycin sulfate prompted the formulation of a topical ointment combining the two. This combination aimed to enhance the wound healing activity effectively.

II. MATERIALS AND METHODS

Neomycin sulphate, Emulsifying wax, white soft paraffin, liquid paraffin, Curcuma longa(Turmeric powder) and all other chemicals were of analytical grade and used without further purification.

Method for preparation of ointment

Emulsifying wax, white soft paraffin and liquid paraffin were heated to 70-75°C to melt it completely. Then neomycin sulphate and / or curcuma longa was / were dissolved in it under stirring and then cooled. The composition of emulsifying ointment base is given in Table 1 and composition of different ointment formulations is given in Table 2.

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Table 1: Composition of emulsifying ointment base

Ingredients	Quantity (%)
Emulsifying wax	30
White soft paraffin	50
Liquid paraffin	20

Table 2: Composition of different ointment formulations

Item	Material Name	Quantity (%)						
		F1	F2	F3	F4	F5	F6	F7
1	Neomycin sulphate	0.5	0.5	0.5	0.5	-	-	-
2	Curcuma longa	-	3	4	5	3	4	5
3	Emulsifying ointment base	q.s.	q.s.	q.s.	q.s.	q.s.	q.s.	q.s.

Spreadability:

The spreadability was assessed using a modified apparatus comprising a wooden block, a fixed glass slide, and a pulley. A movable glass slide, connected to a pan via a string, was also part of the setup. To measure spreadability, a predetermined quantity of ointment was placed on the fixed glass slide. The movable glass slide, with the attached pan, was then positioned over the fixed slide, sandwiching the ointment between them for 5 minutes. Subsequently, a weight of approximately 50 grams was added to the pan, and the time taken for the slides to separate was recorded. Spreadability was calculated using the formula: S = M/T, where S represents spreadability in grams per second, M denotes mass in grams, and T signifies time in seconds.

Extrudability:

A sealed collapsible tube filled with ointment was firmly squeezed at the sealed end. Upon removing the cap, ointment was squeezed out until the pressure was released. The amount of weight in grams needed to extrude a 0.5 cm strip of ointment within a span of 10 seconds was then measured.

Viscosity:

The viscosity (expressed in cps) of the prepared ointment formulations in their semisolid state was measured using the Brookfield digital viscometer. The T-D spindle (spindle code S 94) was rotated at speeds of 2.5, 4, 5, and 10 rpm, and readings were taken when the torque approached 100%. The measurements were conducted at a temperature of 30 ± 1°C.

Skin irritation study:

Three albino rabbits were chosen for the investigation. The areas designated for testing, located on both sides of the spine, were depilated and marked 24 hours before the experiment. The appropriate amount of ointment was administered to the designated test areas. Observations for erythema and edema were conducted on the test sites for 48 hours following application.

Stability of formulations:

The ointment formulations underwent assessment for physical alterations such as phase separation and variations in color, odor, consistency, etc., which could impact their stability and desired characteristics. Samples of the ointment formulations were subjected to varying temperature conditions (25°C, 30°C, and 40°C) over a period of 45 days. These samples were regularly inspected for physical changes such as phase separation and the emergence of undesirable color and odor. Furthermore, the antibacterial efficacy of the formulations was evaluated after the 45-day period.

III. CONCLUSION

The objective of this study was to validate the hypothesis suggesting that combining Curcuma longa, which enhances tissue formation, with Neomycin, which offers protection against microbial invasion, would result in a more effective wound healing treatment, preferably within a single formulation. Consequently, the development of a formulation containing both Curcuma longa and Neomycin became necessary to pursue this

goal. Furthermore, it was essential to assess whether such a formulation met the standard criteria required for acceptance as a medicinal agent.

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