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Topical Antimicrobial Polyherbal Formulation: Preparation and Evaluation of Different Parameters

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Abstract:

Herbal medicines are becoming increasingly popular.. Herbal medicines for skin disorders are gaining popularity due to the belief that they are safer and have fewer side effects than other treatments. The primary goal of this study was to create and test antimicrobial polyherbal ointments containing leaf extracts of Neem (Azadirachta indica) and Tulsi (Ocimum tenuiflorum). Cold maceration was used to create the hydroalcoholic extracts. The various ointment bases were prepared. They were evaluated for physicochemical parameters such as nature, colour, odour, pH, spreadability, extrudability, consistency, skin irritation, and gave satisfactory results after formulation. For antimicrobial activity against Staphylococcus aureus, the best formulation was used. The prepared formulation's antimicrobial activity was compared to that of a commercial formulation (10% w/w betadine). The overall result of this study reveals that this is an effective polyherbal antisptic ointment.

Keywords: herbal medicine, neem, tulsi, polyherbal, antimicrobial.

INTRODUCTION

For thousands of years, medicinal plants have been known for their disease-curing properties, and several drugs have been isolated from natural sources based on their use in traditional medicine. [1] Natural phytochemicals isolated from fruits, vegetables, and herbs have a variety

of pharmacological effects, including antioxidant, antimicrobial, and anti-inflammatory properties, among others. [2] There are numerous reasons for the increased acceptance of herbal medicines, such as the fact that they are derived from "nature" and are "safer" than conventional medicine. [3] Ointments, pastes, creams, emulsions, gels, and rigid foams are examples of pharmaceutical semisolid preparations. [4] A common property of semisolids is their ability to remain on the surface of application for an extended period of time before being washed or worn away. [5] Semisolid adhesion is due to their plastic and rheological behavior this allows the semisolids to keep their shape and adhere as a film until they are acted on by an external force. They deform and flow after the force is applied. [4] A typical human skin consists of three layers.

Nerves, nerve endings, glands, hair follicles, and blood vessels are located beneath the skin's surface. [6] Polyherbal formulations are created when two or more herbs are added to a formulation. [7,8] Polyherbal The ability of a substance to inhibit or kill bacterial cells is referred to as antibacterial activity.

Microorganisms such as Staphylococcus aureus and Escherichia coli are the most common pathogens. Cause a variety of skin diseases such as rashes, acne, eczema, psoriasis, dermatitis, and others [9] One example is a topical ointment containing a medicinal plant extract.

MATERIAL AND METHODS

Collection of plant material:

The plants (Azadirachta indica and Ocimum tenuiflorum) were collected from Sunder Deep Pharmacy College's herbal garden.

Extraction process

Cold maceration was used to extract the plants (Azadirachta indica & Ocimum tenuiflorum). The hydroalcoholic mixture was kept in contact with 100g of dried and powdered plant leaves (alcohol: distilled water in the ratio of 1:3). The extraction took three days to complete. The solvents were evaporated after extraction, and the concentrated residue was obtained.

Powdered *Tulsi* Leaves

Powdered *Neem Leaves*

Formulation of Ointment:

Weighed and melted the necessary amounts of emulsifying wax, liquid paraffin, and white soft paraffin. Adequate amounts of hydroalcoholic extract from the two plants mentioned above were added to this and thoroughly mixed until a homogeneous mass was obtained. This was known as Formulation F1. Similarly, the ointments for the Absorption base (Formulation F2) and Hydrocarbon base were made using the fusion method (Formulation F3).

Table.1 Composition of Ointment Bases

S.No	Ingredients	Emulsifying Base (F1)	Absorption Base (F2)	Hydrocarbon Base (F3)
1.	Yellow Soft Paraffin	-	-	-
2.	Wool Alcohol	-	-	-
3.	White Petrolatum	5	8.5	9
4.	Hard Paraffin	-	0.5	0.3
5.	White Beeswax	-	-	0.2
6.	Liquid Paraffin	2	-	-
7.	Cetostearyl Alcohol	-	0.5	0.5
8.	Wool Fat	-	0.5	-
9.	Emulsifying Wax	3	-	-
10.	Purified Water	q.s. to 10 g	q.s. to 10 g	q.s. to 10 g

Table.2 Formula for Herbal Ointment

INGREDIENTS	QUANTITY TAKEN
Neem Extract	0.2 g
Tulsi Extract	0.2 g
Ointment Base	q.s. to 10 g

EVALUATION OF OINTMENT FORMULATION:

a) Color and Odour: - Colour and odour were examined by visual examination.

b) PH: A digital pH metre was used to determine the pH of the prepared formulation. One gram of ointment was dissolved in one hundred millilitres of distilled water and stored for two hours.

c) Spreadability Test: Spreadability is a term used to describe the extent to which ointments spread after being applied to the skin or affected area. The Spreadability was measured in terms of the time it took two slides to slip off the ointment and place in between the slides under a specific load. The shorter the time required to separate two slides, the better the Spreadability. The formula was used to calculate spread ability.

$$S = (M.L/T)$$

Where S = Spreadability
M = Weight tied to upper slide
T = Time.
L= Length of glass slides
T= Time taken to separate the slides

d) Extrudability: For this study, a simple method was used. After the ointments were placed in the container, the formulations were placed in collapsible tubes. The weight in grammes required to extrude a 0.5 cm ribbon of ointment in 10 seconds was used to determine the extrudability of the various ointment formulations.

e) Viscosity: The ointment's viscosity was determined using a Brookfield viscometer with spindle # 7.

f) Stability Study: A physical stability test of herbal ointment was performed at 80°C for 50 minutes, and stability was maintained for one month. During the first month, all formulations were tested for colour, odour, texture, traces of gritty particles, and skin irritation.

g) Antimicrobial activity: Antimicrobial screening in vitro was performed by *Method of the Cylinder*. Plate the antimicrobial activity of an ointment prepared with a hydroalcoholic extract of Azadirachta indica and Ocimum tenuiflorum leaves was tested. The activity was carried out in the presence of the pathogenic bacteria Staphylococcus aureus. Standard and test samples were placed in a hole bored in the centre of the solidified nutrient agar medium inoculated with microorganisms. They are then incubated at 37 °C for about 18 hours. The zone of inhibition was identified after incubation.

OBSERVATION AND RESULTS

Evaluation of Ointment

Table.3 Physicochemical Evaluation Parameters for Ointments:

S.No	Parameter	Ointment Formulation		
		F1	F2	F3
1.	Nature	Semisolid	Semisolid	Semisolid
2.	Color	Brown	Brown	Brown
3.	Odour	Characteristic	Characteristic	Characteristic
4.	Consistency	Smooth	Smooth	Smooth
5.	Trace of gritty particles	Absent	Absent	Absent
6.	Skin irritation	Non irritant	Non irritant	Non irritant
7.	pH	6.88	6.74	5.9
8.	Spreadability	6.93g.cm/min	6.27g.cm/min	7.27g.cm/min
9.	Extrudability	0.5g	0.5g	0.4g
10.	Viscosity	5197pa/s	5761pa/s	6249pa/s

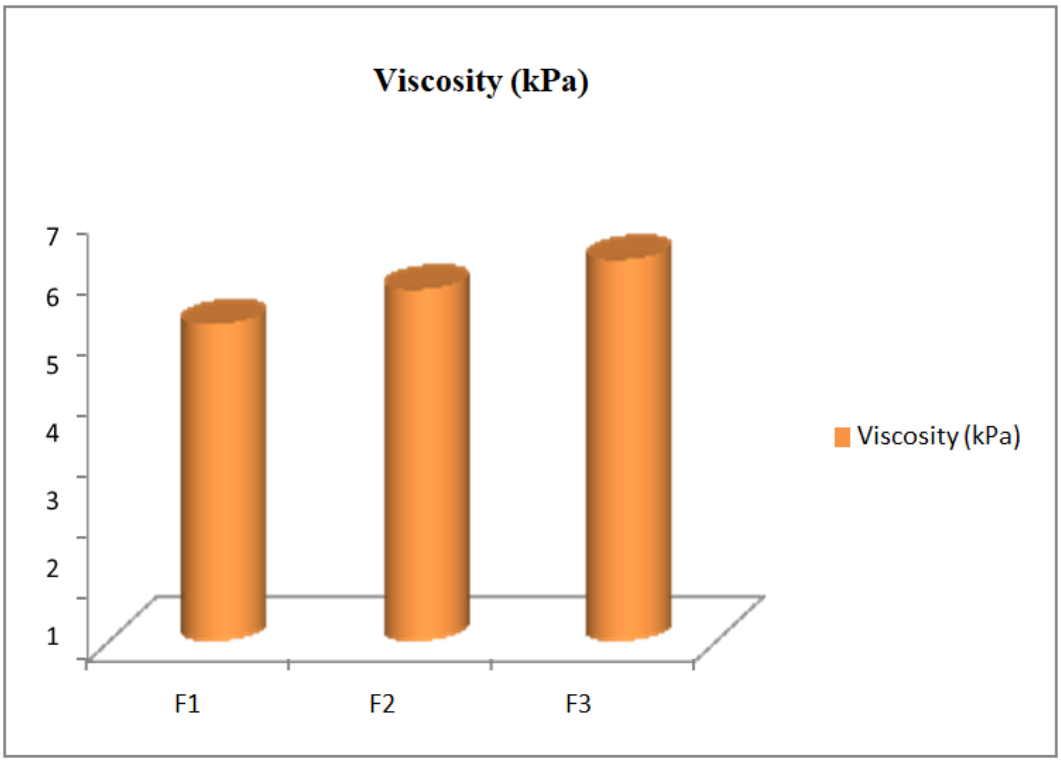

Figure1: Viscosity of Formulation F1, F2 and F3

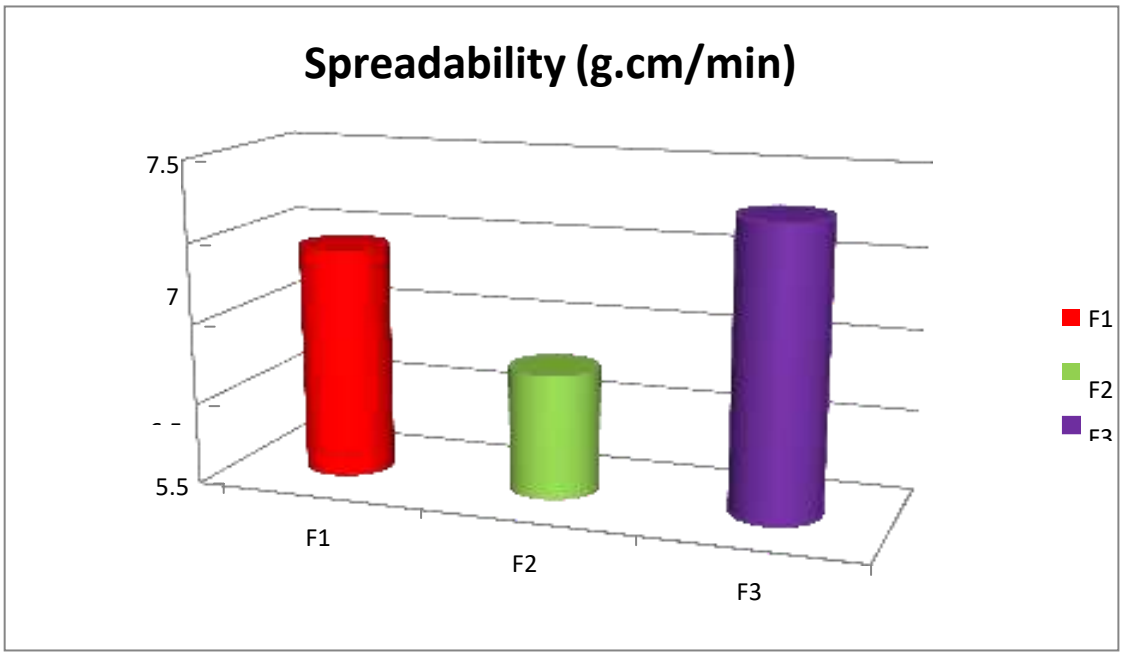

Figure-2: Spreadability of Formulation F1, F2 and F3

Table 4.2 Evaluation of antimicrobial activity by Cylinder Plate Method

Preparation	Zone of Inhibition
4% Polyherbal ointment (Absorption Base)	0.2 cm
10% betadine ointment	0.35 cm

Figure-3: Zone of Inhibition (in cm)

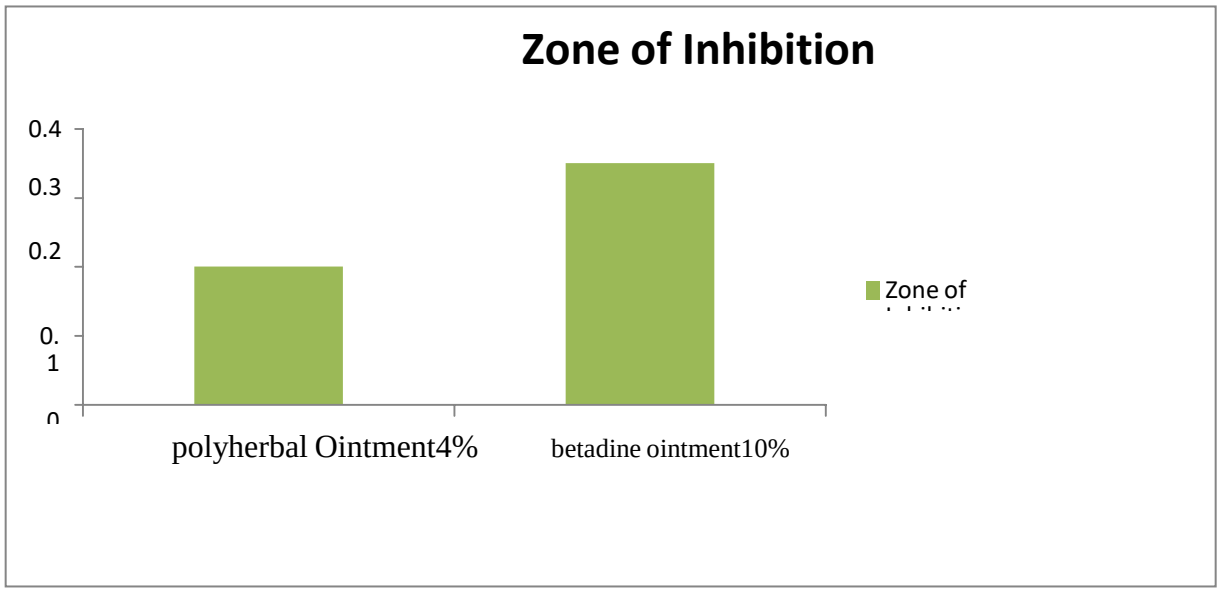

Figure-4: Zone of Inhibition

According to the literature, the herbs Azadirachta indica and Ocimum tenuiflorum have antibacterial activity. As a result, an attempt was made to formulate a 4% polyherbal ointment and use the cylinder plate method to evaluate its physical parameters and antimicrobial activity. Furthermore, the antibacterial activity of the prepared formulation was compared to that of a marketed formulation (10% w/w Betadine). Cold maceration was used to create the extract. To avoid the loss of active constituents, the cold maceration process was used. For extraction, a hydroalcoholic solvent was used. Polyherbal ointments were created in this study using the fusion method and an absorption base, an emulsifying base, and a hydrocarbon base. The physical parameters of the formulations were then evaluated and compared to commercial 10% w/w betadine ointment for its antibacterial activity. These physical parameters of Azadirachta-indica and Ocimum tenuiflorum can also be used for treating various type of skin infections.

CONCLUSION

The purpose of the study was to prepare antimicrobial polyherbal ointment using locally available plants. On the basis of antimicrobial efficacy, two different local plants were taken and their hydroalcoholic extracts were incorporated in the most effective ratio in the appropriate base. The final product readily spread on the skin surface, showed no irritant effect, diffused well and was stable at different temperatures, and has effective antimicrobial activity.

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