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FORMULATION AND EVALUATION OF ANTIFUNGAL GEL FROM ETHANOLIC EXTRACT OF *TECTONA GRANDIS*

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ABSTRACT

The objective of the present investigation was to develop and evaluate antifungal gel from ethanolic extract of Tectona grandis. The frontal leaves of Tectona grandis (Verabenaceae) are widely used in the folklore to treat various kinds of infection. The aim of this study was, to formulate new effective antifungal gel from ethanolic extract. The gel was formulated by using different polymers with different concentration as Carbopol 934. The physiochemical parameters of formulations (pH, viscosity, Spreadability and homogeneity) were determined. Drug Extract -excipients compatibility studies were confirmed by carrying out FT-IR. Candida albicans & Aspergillus Niger was used as a model fungus to evaluate the antifungal activity. Gel formulations good in appearance & Homogeneity & easily spread able. Formulation significantly shows zone inhibition on Candida albicans & Aspergillus Niger. formulations non irritant and not show any skin toxicity.

KEYWORDS: Tectona grandis, ethanolic, albicans & Aspergillus.

INTRODUCTION

Natural products are a source of synthetic and traditional herbal medicine and are still use in the primary health care system. Plants based antimicrobials represent a vast untapped source for medicines and further exploration of plant antifungal needs to occurs. Over the past twenty years, there has been a lot of interest in the investigation of natural materials as sources of new antifungal agents. Different extracts from traditional medicinal plants have been tested. Many reports have showed the effectiveness of traditional herbs against fungus; as a result, plants are one of the bedrocks for modern medicine to attain new principles. The frontal leaves of *Tectona grandis* are widely used in the folklore to treat various kinds of infection. The aim of this study was, to formulate new effective antifungal gel from ethanolic extract. *Tectona grandis* is commonly known as Indian Teak, and it belongs to the family Verbenaceae. They are also useful to treat haemostatic, depurative, inflammation and vulnerary and also useful in leprosy, skin disease, pruritus, stomatitis, indolent ulcer, haemorrhag and haemoptysis.[1] Phytochemicals from various extracts of the leaves of *Tectona grandis* contain phenol & tannin has been noted.[2] So that it give antimicrobial & antifungal activity. The present work deals with the screening of *Tectona grandis* leaf ethanolic extract for antifungal activity against Candida albicans & Aspergillus niger.

Gel formulation could be improved the dermatomycosis are the most wide spread superficial fungal infection among human beings. Most of antifungal drugs have lots of side effects such as stomach and intestine problems, kidney problem may occurred, especially upon oral administration, so topical application of the drug we can avoid these side effects.

Topical preparations are formulae which are applied directly to an external body surface by spreading, rubbing, spraying or instillation**.** The topical route of administration has been utilized either to produce local effect for treating skin disorder or to produce systemic drug effects. Within the major group of semisolid preparations, the use of transparent gels has expanded both in cosmetics and in pharmaceutical preparations. Gels often provide a faster release of drug substance, independent of the water solubility of the drug, as compared to creams and ointments. They are highly biocompatible with a lower risk of inflammation or adverse reactions, easily applied and do not need to be removed. Gels for dermatological use have several favorable properties such as being thixotropic, greaseless, easily spreadable, easily removed, emollient, non-staining, compatible with several excipients and water soluble or miscile.[3]

The goal of our research to formulate and evaluate carbapol 934 polymers with varying concentrations for the preparation of a safe, effective and stable gel containing *Tectona grandis* leaf ethanolic extract and evaluate the in-vitro performance, stability and also evaluate the in-vitro antifungal activity & does not give any side effect or any dermatological action for prepared formulation.

MATERIAL AND METHOD

Chemical: Carbapol 934, Glycerin, Benzyl alcohol, Tween 80, Tri-ethanolamine, Sodium sulphate.

Collection of Plant Material: The authentic Tectona grandis leaves (Verabenaceae) were collected from the campus of Sahyadri College of Pharmacy, Methwade, Solapur. The collected leaves were washed thoroughly under running water and air dried for few minutes. The fresh leaves were immediately extracted with the solvents.

Extraction preparation: 5 gram of fine powder of plant material was extracted with 100 ml of an appropriate solvent in a round bottom flask with magnetic stirrer for 24 hours at room temperature. The leaves extract were then centrifuged at 5000 rpm for 15 min. An external magnetic field is applied to the magnetic stirrer to mix the solution which facilitates the rotating of the small magnetic bar placed in the mixture of interest.

Solvent: Ethanol used as solvent for extraction

Formulation of the Gel

Take weighed amount of carbapol 934 and soak in to the water for half hrs. Then the mixture was kept in a hot air oven at 100^{o} C for 30 minutes with stirring. The mixture is stirred for 10 - 15 minutes to avoid air bubbles with glass rod and kept aside for 30 minutes. The mixture was homogenized for 10 minutes. Then add weighed amount sodium sulphate, glycerin and heat on water bath. Add tween-80, benzyl alcohol & plant extract continuously stir up to the homogeneous mass is formed. Finally, remaining quantity of water was added with tri-ethanolamine to neutralize the pH. Prepared gel was filled in glass container and stored at a cool and dry place.

Table No. 1: Formulation Gel.

Sr. No.	Name of Ingredient	G1 (ml)	G2 (ml)	G3 (ml)	G4 (ml)
1	Plant extract	1	2	3	6
2	Carbapol 934	2.5	3	6	12
3	Glycerin	25	25	50	100
4	Benzyl alcohol	2.5	3	6	12
5	Tween 80	1.5	2	4	8
6	Tri-ethanolamine	1	1.5	3	6
7	Sodium sulphate	0.5	1	2	4
8	Dist. Water	Q.S.	Q.S.	Q.S.	Q.S

Evaluation of Gel Formulations

1. Drug-Excipients Compatibility Studies

Fourier Transfer Infrared spectrophotometer (FTIR)

The FTIR studies were carried for the extract, the polymers and the drug-polymer physical mixture in the ratio 1:1 were mixed separately with IR grade KBr in the ratio of (100:1) and corresponding discs were prepared by applying 5.5 metric ton of pressure in a hydraulic press using FTIR Spectrophotometer.

2. Determination of pH

The pH value of gel formulation was determined by using a pH meter.

3. Appearance and Homogeneity

All developed gels were tested for physical appearance and homogeneity by visual observation.

4. Viscosity

The measurement of viscosity of the prepared gel was done with Brookfield viscometer. The reading was taken at using spindle no. 64.

5. Spreadability

The spread ability of gel formulations was determined by measuring the spreading diameter of 1g of gel between two horizontal plates (20 cm × 20 cm). It can be determined by as Take two slides. Add gel on a slide apply pressure up to 250gm. Then after some time separate that slides and note down the time required separation of slide.

Formula used for spredability:

$$S = Ml/t$$ Where

M = mass, L = length of slide, T = time

6. Antifungal Assay: Agar well diffusion method the amount 15-20 mL of sabouraud agar was poured on glass petro plates of same size and allowed to solidify. Agar surface of each plate was streaked by a sterile cotton swab with the reference fungal strain. Agar plate was punched with a sterile cork borer of 8 mm size and 0.5ml of each sample was poured with micropipette in the bore. The plates were allowed to stand by for 30 min. The plates were incubated at 37°C for 48 h. for 5 day.

7. Skin Irritation Test

The wistar albino rat's of either of sex, weighting 150gm-200gm were used for activity. Intact skin was used. Hairs removed from rat before three day of experiment. at hair remove area gel was applied for daily up to 7 day , finally treated area was examine visually for erythema & edema.

RESULT AND DISCUSSION

Extract- Excipients Compatibility Studies

The evaluation of formulation study includes extract excipients compatibility deliberate by FT-IR analysis. FT-IR study showed that there was no major change in the position of peak obtained in extract alone & in a mixture of extract & excipient, which shows that there was no interaction between extract & excipient.

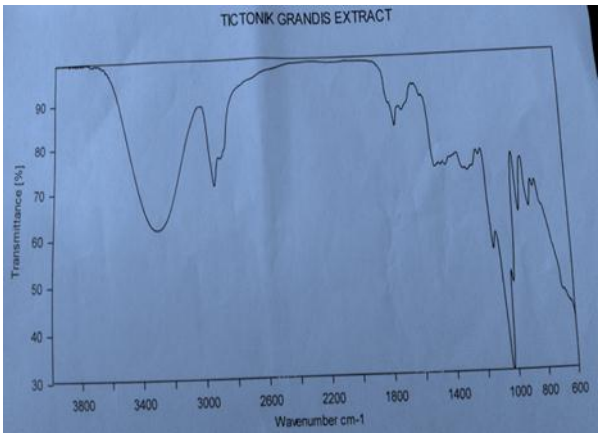

Fig. No. 1: FTIR of Extract.

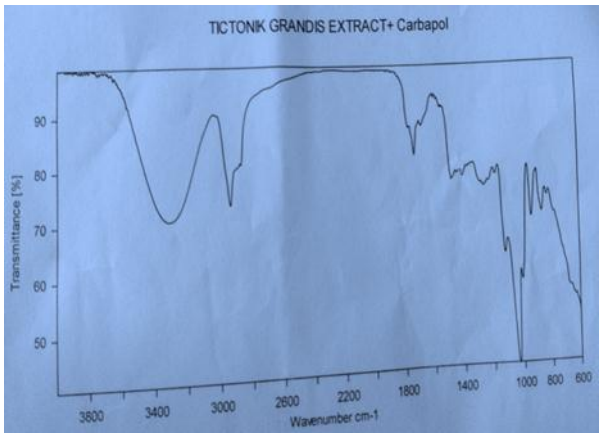

Fig. No. 2: FTIR of Extract –Carbapol Mixture.

pH

For the measurement of pH of formulation, pH meter is used. A different concentration of gel gives different pH as shown in table.

Table No. 2: Shows pH of Formulated Gel.

Formulation	G1	G2	G3	G4
pH	6.4	6.5	6.6	6.7

Viscosity

The viscosity is measured by using the Brookfield viscometer. Different concentration of gel can give the different viscosity as shoe in table.

Table No. 3: Shows Viscosity of Formulated Gel.

Formulation	Torque	Viscosity (centipoises) η	RPM
G1	1.1	1220	100
G2	1.8	1460	100
G3	25	1674	100
G4	35	1788	100

Spreadability

Table No. 4: Shows Spreadability of Formulated Gel.

Formulation	G1	G2	G3	G4
Spreadability (gm.cm/ sec)	182	260	324	389

Skin Irritation

Formulations were non irritant and did not show any skin toxicity when applied daily for 7 days on rat.

Antifungal Assay

In the present study formulation was effective in inhibition the growth of fungal strain. The formulation G1, G2, G3, G4 shows significantly zone inhibition with Candida albicans & aspergillus niger.

Table No. 5: Shows Zone of Inhibition.

Formulation	Diameter of Zone of inhibition (mm)	
	Candida Albicans	Aspergillus Niger
G1	23	22
G2	25	23
G3	26.5	25
G4	26	24

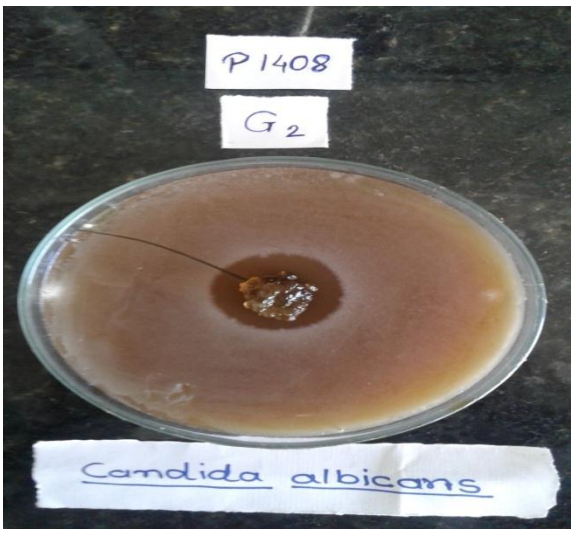

Fig. No. 3 Zone Of Inhibition with Candida Albicans.

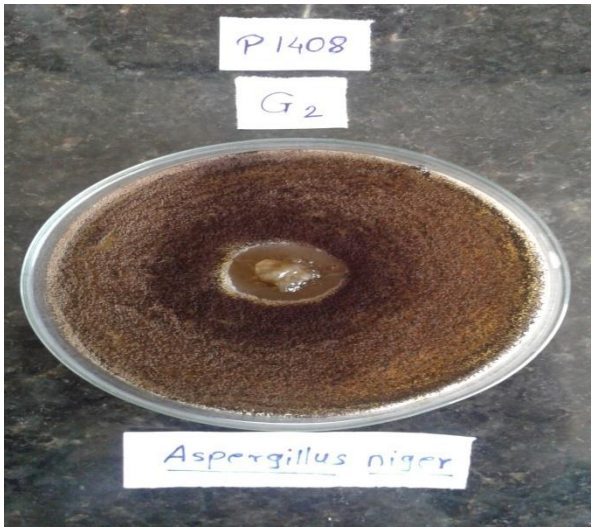

Fig. No. 4 zone of inhibition with aspergillus niger.

CONCLUSION

Natural product are more acceptable in the belief that they are safer with fewer side effects than the synthetic ones. Herbal formulations have growing demand in the world market. It is a very good attempt has made to establish the herbal gel containing ethanolic leaves extract of Tectoea grandis at various concentration. Gel formulations are good in appearance & Homogeneity& easily spread able. Formulation significantly shows zone inhibition on Candida albicans & Aspergillus Niger. Formulations were non irritant and did not show any skin toxicity when applied daily for 7 days on rat. Therefore, it was concluded that our formulation could be very promising topical alternative for the treatment of skin fungal infections.

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