

FORMULATION AND EVALUATION OF POLYHERBAL ANTIMICROBIAL GEL

**V. S. Jadhav¹, V. B. Ghawate*¹, R. B. Pandhare¹, D. G. Bacchav² &
S. D. Kharad¹**

1. Department of Pharmacognosy, MES's College of Pharmacy, Sonai, Ahmednagar (MH 414105), India.
2. Department of Pharmaceutics MGV's SPH College of Pharmacy, Malegaon, Nasik (MH 423105), India.

Corresponding author:
Dr. Vilas B. Ghawate,
Associate Professor and HOD
Department of Pharmacognosy,
MES's College of Pharmacy,
Sonai, Ahmednagar (MH 414105), India.
Mobile No. 09960205257.
E-mail: ghawatevilas@gmail.com

Abstract:

*The present research has been undertaken with the aim to formulate and evaluate the polyherbal gel containing the extract of *Allium sativum* (Garlic), *Curcuma longa* (Turmeric) and *Cinnamomum zeylanicum* (Cinnamon). The polyherbal gel formulation was prepared by using Carbapol 934, *Allium sativum* (Garlic) bulb extract, *Curcuma longa* (Turmeric) rhizome extract and *Cinnamomum zeylanicum* (Cinnamon) bark extract, propylene glycol, methyl paraben, propyl paraben, glycerine, and required amount of distilled water. The skin pH (6.8-7) was maintained by drop wise addition of tri-ethanolamine. The physical parameters of formulated gel like color, homogeneity, pH, viscosity and Spreadability was evaluated. The gel was evaluated for antimicrobial efficiency by agar well diffusion method against *Staphylococcus aureus*. The polyherbal gel showed better antimicrobial activity.*

Key words: *polyherbal gel, Allium sativum, Curcuma longa, Cinnamomum zeylanicum, antimicrobial.*

INTRODUCTION

Medicinal plants have been a major source of cure for human diseases since time immemorial. In all over the world more than 80% population is depend on the traditional system of medicines. In recent years there is increase in interest to use medicinal plants for various disease treatments, because herbal drugs/medicines are safe and have minimum side effects as compared to synthetic drugs. Evolution has already carried out a screening process whereby plants are more likely to survive if they contain potent compounds, which detain animals or insects from eating them. These potent compounds are secondary metabolites with quite complex structures, in which most of them are biologically active compounds. [1, 2]

Herb-herb combination also called as polyherbal therapy. This is used in Chinese medicine practice for thousands of years but scientific evidence of their therapeutic benefits is lacking. Drug combinations are producing a promising effect in treatment of disease over a single drug. The concept of drug combination was well established in Western medicines and remarkable success has been achieved over decades. Naturally occurring herbs and herbal ingredients organized into certain formula have been shown to have potential interaction effects. These include mutual enhancement, mutual assistance, mutual restraint and mutual antagonism. [3]

In the present research by considering the concept of polyherbalism, antimicrobial gel was formulated and evaluated using the herbs such as *Curcuma longa* (Family- Zingiberaceae) *Cinnamomum zeylanicum* (Lauraceae) and *Allium sativum* (Liliaceae) for antimicrobial screening against pathogenic microorganisms.

MATERIALS AND METHODS:

Collection of plant material

The plants selected on the basis of their antimicrobial activities as reported in literature. The herbs *Allium sativum* (Garlic), *Curcuma longa* (Turmeric) and *Cinnamomum zeylanicum* (Cinnamon) were collected from local market. All other chemicals were purchased from Qualigen fine chemicals.

Preperation of Herbal Extracts

The dried powder of rhizomes of *Curcuma longa*, bark of *Cinnamomum zeylanicum* and bulbs of *Allium sativum* were used for extraction. The ethanolic extraction was done by maceration method. The extract obtained was concentrated in petri dish. Prepared extract was filled into suitable container until use.

Developement of polyherbal gel formulation

For the preparation of gel formulation, firstly take carbopol 940 which was then dispersed in distilled water along with methyl paraben, propyl paraben and glycerine kept for overnight. Take the prepared extract of *Curcuma longa*, *Cinnamomum zeylanicum* and *Allium sativum* in propylene glycol which was then added in polymer dispersion. Remaining quantity of water was then added and neutralized to pH 7 with triethanolamine by constant stirring for 10 minutes. [4]

Table 1: Formulation of polyhebal gel

S. N.	Ingredients	Quantity
1	<i>Curcuma longa</i> extract (%w/w)	1 %
2	<i>Cinamomum zeylanicum</i> extract (%w/w)	1 %
3	<i>Allium sativum</i> extract (%w/w)	1 %
4	Carbopol 934	1 gm
5	Methyl paraben 0.5 %	0.2 ml
6	Propyl paraben 0.2 %	0.1 ml
7	Glycerine	1 ml
8	Propylene glycol	2 ml
9	Triethanolamine to adjust pH	q.s.
10	Distilled water	100 ml

**Figure 1: Formulation of polyherbal antimicrobial gel****Evaluation of Herbal gels:****Physical evaluation:**

The formulated polyherbal gel was checked for color and homogeneity by visual observation.

pH:

The pH of the formulated herbal gel was measured by using digital pH meter. [5]

Viscosity:

Viscosity of herbal gel was determined by using Brookfield rotational viscometer at 100 rpm using spindle no.64. [5]

Spreadability:

The spreadability of gel formulation was determined by measuring the spreading diameter of 1g of gel between two horizontal plates. [6]

Skin Irritation test:

It was performed on 10 healthy volunteers comprise of both male and female. About 1gm of gel preparation was applied on the hand of all the volunteers and held for particular period of time. After 2 hours, the test area was observed for any visible signs which might be the result of skin irritation [7].

Antibacterial activity:

Agar well diffusion method was used for this purpose.

Staphylococcus aureus and *Escherichia coli* strains were used for the study. Bacterial cultures were poured to the freshly prepared nutrient media and stirred properly so that there would a uniform distribution of the culture all over the media. The media was poured in sterilized petri dishes and the media was stand still and allowed to solidify. Then, with the help of sterile cork borer wells were made in the petri dishes of 6mm diameter each, to which the prepared gel formulations were added and allow the drug to spread in the media [8]. Then it was incubated for 24 hours at 37° C. The diameter of zone of inhibitions was observed and with the help of ruler was measured (in mm). Each formulation’s antibacterial activity was measured in triplicate form and their mean value was recorded. Here, in the study clindamycin gel was used as the standard drug for the comparison.

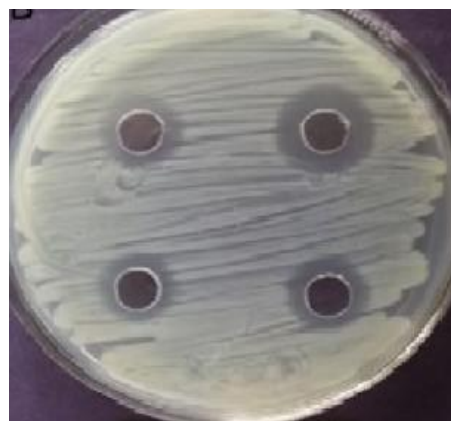
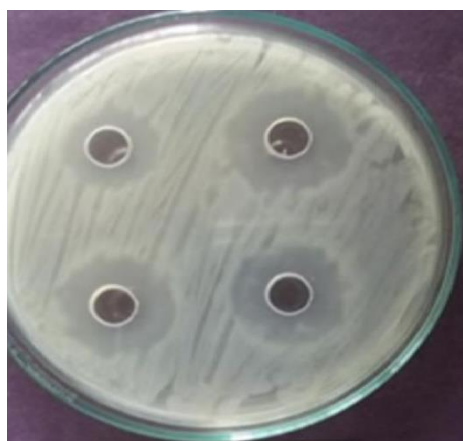
Result and Discussion:

Evaluation parameters of gel formulations:

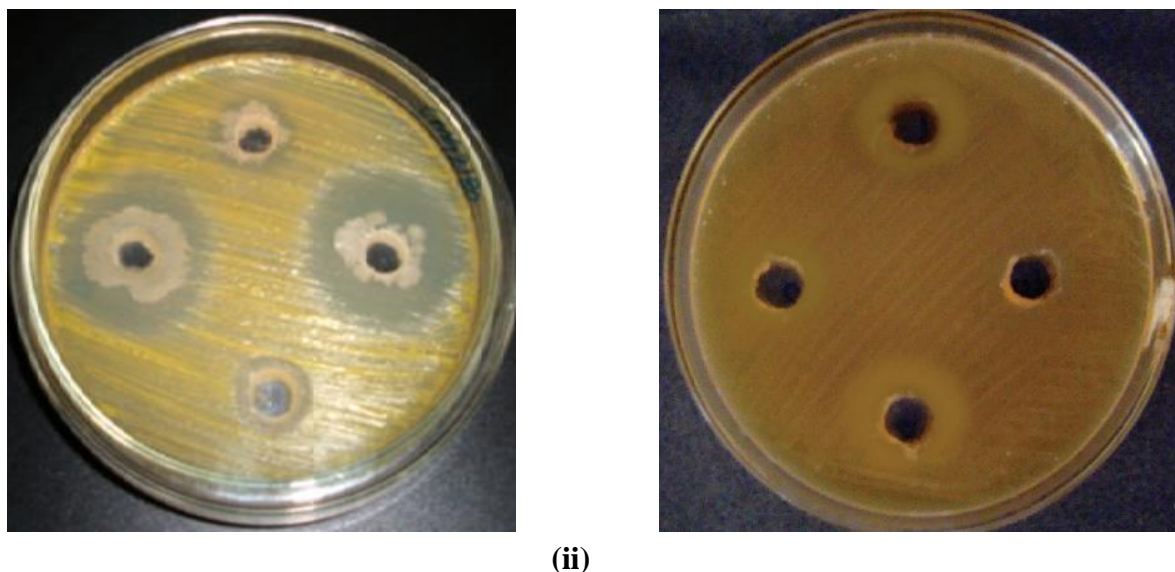
Both physical and microbial evaluation of the prepared gel formulation was performed. Gel was found to be having a transparent appearance and yellowish in color. pH of the gel was found to be 6.9. When the gel was applied to the skin of the healthy volunteers it was found to be nonirritant. Microbial evaluation was measured in terms of formation of zone of inhibitions and Clindamycin was taken as the standard drug. The antimicrobial activity of the formulated poly herbal gel showed good results of zone of inhibition against common skin pathogens.

Table 2: Evaluation parameters of the prepared gel formulations

Appearance and color	Homogeneity	pH	Viscosity (cp)	Spreadability diameter after 1 min(mm)	Skin irritation
Transparent and yellowish gel	Good	6.9	4478	43	Non irritant
Results are based on the mean value of the three readings taken for polyherbal formulation.					



(i) (ii)
Figure 2: Zone of inhibition in standard gel- Clindamycin (i) *S. aureus* (ii) *E. coli*



(i) **Figure 3: Zone of inhibition in polyherbal gel formulation (i) *S. aureus* (ii) *E. coli***

Table 3: Antimicrobial activity of polyherbal gel

Particulars	Zone of inhibition (mm)	
	Standard drug gel Clindamycin	Polyherbal formulation
<i>S. aureus</i>	29	25
<i>E. Coli</i>	30	24
Results are based on the mean value.		

Discussion:

Majority of the herbal products in Indian system of medicine are made using the crude extracts and directly incorporating them in to a form convenient for dispensing. In the attempts to improve their potential and tap them to the optimum extent, by improving the bioavailability and avoiding the limitations of drug entrapment and release, the novel drug delivery systems were developed.

The herbal drugs though numerous in nature, with antimicrobial activity were insignificantly established as potential drugs for use, when compared to standard synthetic drugs. There is a direct relationship between the plant extract concentration and the anti-bacterial activity. When incorporated into gel formulations, polyherbal extracts gel has shown to be effective against both organisms at different concentrations. The gel formulations showed good physicochemical and stability characteristics.

Acknowledgement:

Authors are thankful to the Managing Body of Mula Education Society's, College of Pharmacy, Sonai, Ahmednagar for providing necessary to carry out this research work. \

Conflict of interest:

The author declares no conflict of interest.

References:

1. Bauer J, Rojus R, Bustamate B. Antimicrobial activity of selected Peruvian Medicinal Plants. *J Ethnopharmacol.* 88; 2003: 199-204.
2. Suresh Kumar Dev, P.K. Choudhury, Rajnish Shrivastav, Moya Sharma-Antimicrobial, anti-inflammatory and wound healing activity of polyherbal formulation, *Biomedicine and Pharmacotherapy*, 111(2019),555-567.
3. Muhammad Shahzad Aslam. An Update Review on Polyherbal Formulation: A Global Perspective, *Systematic Reviews in Pharmacy.*, 2016;7(1):35-41.
4. Jadhav VD, Talele SG, Bakliwal AA, Chaudhari GN., Formulation and evaluation of herbal gel containing *Tridax procumbens*. *J Pharma Bio Sci.* 3 (2); 2015: 165-172.
5. Deepak PA, Prashanth BS. Formulation and evaluation of herbal gel containing *Lanata camara* leaves extract. *Asian J Pharm CliniRes.* 6 (3); 2013: 122-124.
6. Ajinkya MB, Manjusha ND. Formulation and evaluation of herbal antimicrobial gel containing *Musa acuminata* leaves extract. *J Pharamcog Phytochem.* 5 (1); 2016: 1-3.
7. Sharma M, Dev SK. Preparation and evaluation of anti-acne herbal gel. *Biomedical and Pharmaceutical sciences.* 2018; (May).
8. Prashant Chauhan, Monika, Formulation and valuation of antibacterial gel containing ethanol extract of thorns of *Bombax ceiba*, *Research Square*, 1-13.