



Received on 12 August 2023; received in revised form, 26 August 2023; accepted, 30 August 2023; published 31 August 2023

FORMULATION AND EVALUATION OF ANTIBACTERIAL GEL USING LEAF EXTRACT OF *PERGULARIA DAEMIA* LINN

Raman Chandak* and Santosh Rahate

Department of Pharmacognosy, School of Pharmacy, G. H. Rasoni University, Nagpur - 440015, Maharashtra, India.

Keywords:

Acene, Extract, Gel, Herbal, Staphylococcus Aurens, *Pergularia daemia* linn

Correspondence to Author:

Dr. Ramankumar R. Chandak

Department of Pharmacognosy,
School of Pharmacy, G. H. Rasoni
University, Nagpur - 440015,
Maharashtra, India.

E-mail: ramankumar.chandak@ghru.edu.in

ABSTRACT: *Pergularia* is an annual herbaceous plant in the family of *Pergularia daemia* linn native to India and Shrilanka. *Pergularia daemia* linn has shown anti-bacterial property which makes it an essential herb in the treatment of various infections. This study was to check the effectiveness of *Pergularia daemia* lin against the microbial species *Staphylococcus aurens*, to observe the zone of inhibition and to develop a topical gel formulation of *Pergularia daemia* linn for the treatment of acne. The extraction was done by maceration method and continues with phytochemical screening and herbal gel formulation using hydroxypropyl methyl cellulose as a base with different concentration 2% v/v, 4% v/v, 6% v/v and 8% v/v. The gel was evaluated for the physical appearance, pH, homogeneity and antibacterial activity. Different concentration of *Pergularia daemia* linn methanolic extract exhibited relatively good antibacterial activity. It was concluded that the gel formulation having higher concentration (8%) is found to be good consistency compared to 2%, 4% and 6% v/v and can be used to treat the antibacterial activity.

INTRODUCTION: India has rich tradition of plant based knowledge of healthcare. The use of the plant based medication is gradually becoming popular throughout the world. Topical gel preparations are intended for skin application or to certain mucosal surfaces for local action or percutaneous penetration of medicament. Gels are typically semi-solid formulations having a liquid phase that has been thickened with other components. The liquid phase allows free diffusion of molecules through the polymers scaffold and hence release should be equivalent to that from a simple solution.

Herbal medicine has become an item of global importance both medicinal and economical. Although usage of these herbal medicines has increased their quality, safety and efficiency are serious concerns in industrialized and developing countries. Herbal remedies are getting increasing patient compliance as they devoid of typical side effects of allopathic medicines.

The present research has been undertaken with the aim to formulate and evaluate the herbal gel containing *Pergularia daemia* linn leaf extracts. The gel formulation was designed by using carbapol 940, *Pergularia daemia* linn leaf extract, propylene glycol, methyl paraben and required volume distilled water. The skin pH was maintained by drop wise addition of Triethanolamine. The physiochemical parameters of formulation (pH, Spreadability, viscosity) were determined. Herbal medicines are



considered safer than allopathic medicines as allopathic medicines are associated with the side effects. One of the methods for its survival is preparation of extract and their formulation for better absorption and penetration of the active moiety into the systemic circulation.

MATERIALS AND METHODS:

Materials:

Collection of Plant Material: The dried leaves of *Pergularia daemia* linn was collected from Dr. Bamu, Aurangabad of August 2019. The plant material was identified and authenticated from Department of Botany, DR.BAMU, Aurangabad.

Preparation of *Pergularia daemia* linn Extract:

The Freshly collected leaves of of *Pergularia daemia* linn were cleaned and air dried under shade for 48 hours. Then dried leaves were then grounded into powder using an electrical grinder. 150 gm of powder was extracted using 250 ml of methanol. The mixture was allowed to stand for 24 hours to ensure that all solvents and samples were completely homogenized. The macerated mixture was then filtered using filtered using filter paper and Buchner funnel. The liquid was concentrated and evaporated using a rotary evaporator under controlled temperature of 55°C. The resultant extract was then stored in a refrigerator, prior to use⁴.



FIG. 1: EXTRACT OF *PERGULARIA DAEMIA* LINN EXTRACT

Formulation of *Pergularia daemia* Linn Gel:

Briefly, Carbapol 940 was dispersed in 50 ml distilled water. It was kept under magnetic stirrer until a homogenous dispersion was formed. 1 g of methyl paraben was dissolved in 100 ml distilled water in a heated water bath. The solution was later allowed to cool. 2 ml methyl paraben was added to

the carbopol dispersion. Then 10 ml propylene glycol 400 and 2 ml glycerin were added to the mixture. Required volume of of *Pergularia daemia* linn extract was added to 100 ml of distilled water to produce. solution at various concentrations (2% v/v, 4% v/v, 6% v/v and 8% v/v). The homogenous dispersion was stirred using a magnetic stirrer. The pH of formulation was then adjusted to a neutral pH by titrating triethanolamine which enhances the gelling properties of carbopol 940. For positive control, gentamicin disc was used. For negative control, gel was prepared without *Pergularia daemia*. **Table 1** below shows the various gel formulations⁴.

TABLE 1: VARIOUS GEL FORMULATIONS FOR THE EXPERIMENT

Gel base A:

Extract concentration	Gel formulation (2%)
Carbapol	1g
Glycerin	2ml
Propylene glycol	10ml
Methyl Paraben	3ml
100% extract of of <i>Pergularia daemia</i> linn	2ml
Distilled water	Up to 100ml

Gel base B:

Extract concentration	Gel formulation (4%)
Carbapol	1g
Glycerine	2ml
Propylene glycol	10ml
Methyl Paraben	3ml
100% extract of of <i>Pergularia daemia</i> linn	4ml
Distilled water	Up to 100ml

Gel Base C:

Extract concentration	Gel formulation (6%)
Carbapol	1g
Glycerin	2ml
Propylene glycol	10ml
Methyl Paraben	3ml
100% extract of of <i>Pergularia daemia</i> linn	6ml
Distilled water	Up to 100ml

Gel Base D:

Extract concentration	Gel formulation (8%)
Carbapol	1g
Glycerine	2ml
Propylene glycol	10ml
Methyl Paraben	3ml
100% extract of of <i>Pergularia daemia</i> linn	8ml
Distilled water	Up to 100ml



FIG. 2: *PERGULARIA DAEMIA* LINN GEL OF CONC 8% V/V

Evaluation of Gel:

Physical Evaluation: Physical parameters such as color, consistency, appearance, wash ability and odour were assessed.

pH: pH of 1% aqueous solution of the formulation was measured by using a calibrated digital pH meter at constant temperature ⁵.

Spreadability: Spreadability denotes the extent of area to which the gel readily spread on application to skin or the affected part. The bioavailability efficiency of a gel formulation also depends on its spreading value. The spreadability is expressed in terms of time in seconds taken by two slides slip off from the gel, placed in between the slides, under certain load. Lesser the time taken for separation of two slides, better the spreadability. Two sets of glass slides of standard dimensions were taken. The herbal gel formulation was placed over one of the slides. The other slide was placed on the top of the gel, such that the gel was sandwiched between the two slides in an area occupied by a distance of 6 cm along the slide. A 30gm weight was tied to the upper slide carefully. The time taken for the upper slide to travel the distance of 6cm and separated away from the lower slide under the influence of the weight was noted. The experiment was repeated three times both formulated gels and marketed gel and the mean time taken for calculation ⁶.

Formula:

$$S = M \times L / T$$

Viscosity: Viscosities of gels were determined using Brookfield viscometer. Gels were tested for their rheological characteristics at 25°C using Brookfield viscometer. The measurement was made over the whole range of speed settings from

10rpm to 100rpm with 30 seconds between 2 successive speeds and then in a descending orders ².

Drug Content Uniformity: About 1 gm of gel was accurately weighed and transferred to 100ml volumetric flask to which about 70ml of methanol was added. After mixing, the volume was made up to 100ml with methanol. The content was filtered using filter paper. A quantity of 1ml was pipette out from the filtrate and suitably diluted with methanol. Then the extract was estimated spectrophotometrically by using Shimadzu UV/VIS spectrophotometer-1700 at respective λ_{max} ².

Antimicrobial Screening of *Pergularia Daemia*

Linn Gel: The anti-bacterial activity of various gel formulations was determined by using modified agar well diffusion method. *S. aureus* and Mueller Hinton agar was used in this method. Modified agar well diffusion method is different from disc diffusion method as the bacteria inoculum were mixed with the agar base and solidified before being incubated. Wells were punched into the agar and were filled with the gel sample. The anti-bacterial activity of gel was then determined ⁴.

RESULT: Figure shows zone of inhibition exhibited by various gel formulations against of *Pergularia daemia* linn. All gel formulations displayed good anti-bacterial activity against of *Pergularia daemia* linn. As expected, 2% gel was less sensitive compared to the higher concentrations and 8% gel exhibited the greatest bacteria inhibition. From the physical observation of A B C & D formulation, it was concluded that gel formulation having "CODE D" is found to be good consistency. Formulation A B & C was found to be thin & very stiff, so formulation D found to be better formula for preparation of hydrogel.



FIG. 3: ZONE OF INHIBITION OF GEL OF VARIOUS CONCENTRATION (2%, 4%, 6% AND 8% V/V GEL) AGAINST *S. AUREUS*

Evaluation of Parameters: Formulation was greenish in colour. Formulation A, B, C and D was found to have semisolid consistency. All the formulation was homogenous, easily washable and had optimal pH which is well suited with normal skin physiology.

Parameters	Gel A	Gel B	Gel C	Gel D
Color	Greenish	Greenish	Greenish	Greenish
Consistency	Semi-Solid	Semi-Solid	Semi-Solid	Semi-Solid
Odour	No	No	No	No
Appearance	Clear and Transparent	Clear and transparent	Clear and Transparent	Clear and Transparent
Washability	Good	Good	Good	Good
pH	6.50	6.55	6.60	6.71
Phase Separation	No	No	No	No
Spreadability	4.90	8.20	10.00	11.10
Viscosity	1847	1888	1815	1824
Drug Content %	60.1	64.3	79.4	85.4

Amongst all the formulation A, B, C, D had very optimum spreadability. Formulation D showed comparatively more spreadability than A, B and C.

CONCLUSION: Different concentration (25% v/v, 50% v/v, 75% v/v and 100% v/v) of *Pergularia daemia* linn methanolic extract exhibited relatively good anti-bacterial activity against gram-positive bacteria strains *S. aureus*. There is a direct relationship between the plant extract concentration and the anti-bacterial activity.

When incorporated into gel formulations, of *Pergularia daemia* linn has shown to be equally effective against both organisms at different concentrations. However, the dose-effectiveness relationship was not apparent for the gel formulations. The gel formulations showed good physicochemical and stability characteristics. From the physical observation of A, B, C and D formulation, it was concluded that gel formulation having "Gel D" is found to be good consistency. Formulation A, B and C was found to be thin and very stiff, so formulation D found to be better formula for preparation of hydrogel.

ACKNOWLEDGEMENT: I would like to express my special thanks to G. H. Raisoni University, Saikheda, Chindwara and M.P, who gave me the golden opportunity to do this wonderful project.

CONFLICT OF INTEREST: No Conflict of interest.

REFERENCES:

1. Sudipta D and Pallab HK: Formulation and evaluation of herbal gel containing *Clerodendron infortunatum* leaves extract. IJPRF 3(1): 140-143.
2. Singh M and Mittal V: Formulation and evaluation of herbal gel containing ethanolic extract of *Ipomoea fistulosa*. Inte J of Science and Research 2014; 3(7): 7.
3. Pawar D: Formulation and evaluation of herbal gel containing *Lanata camara* leaves extract, Asian J Pharm Clin Res 2013; 6(3): 122-124.
4. Dahlan A: Formulation and characterization of Anti-bacterial gel using Tenggek bBurung (*Milicope ptelefolia*). Department of Pharmaceutics, Faculty of pharmacy, Cyberjaya University college of medical science, Lot 3410 jalan Teknokrat
5. Patel V: Topical gel preparation comprising cyanobacterial metabolites Phd thesis NMU jalgaon.
6. Jadhav P: Formulation and evaluation of Anti-acne face wash Gel, Satara College of pharmacy, Satara Deogaon, India.

How to cite this article:

Chandak R and Rahate S: Formulation and evaluation of antibacterial gel using leaf extract of *Pergularia daemia* linn. Int J Pharmacognosy 2023; 10(8): 485-88. doi link: [http://dx.doi.org/10.13040/IJPSR.0975-8232.IJP.10\(8\).485-88](http://dx.doi.org/10.13040/IJPSR.0975-8232.IJP.10(8).485-88).

This Journal licensed under a Creative Commons Attribution-Non-commercial-Share Alike 3.0 Unported License.

This article can be downloaded to **Android OS** based mobile. Scan QR Code using Code/Bar Scanner from your mobile. (Scanners are available on Google Playstore)