ORIGINAL ARTICLE

RB SCIENCE
ENTERPRISING BIOSCIENCE RESEARCH

**JOURNAL OF PHARMACOLOGY AND BIOMEDICINE**

Published by RB Science Home Page: www.jpbiomed.com

# Formulation development and evaluation of polyherbal gel of effective treatment of acne

Neha Chopra[1*], Uday Pratap Singh[1], Vivek Tiwari[2], Ashish Dixit[3]

[1]SOP, ITM University, Gwalior; [2]Shri Ramdham Mahavidhyalaya(Pharmacy) Mauranipur (UP); [3]SHPC, UP

*Article History*

Received on: 10/06/2024

Revised on: 11/06/2024

Accepted on: 13/06/2024

Published on: 17/06/2024

***Keywords***

*Acne*

*Herbal Gel*

*Propionibacterium acnes*

*Embelia ribes*

*Acacia nilotica*

*Chenopodium album*

**ABSTRACT**

The present investigation in this research work, the Anti-acne activity of polyherbal gel of Seeds of Embelia ribes, bark of Acacia nilotica and leaves of Chenopodium album were evaluated against Propionibacterium acnes pathogens used under present study. The polyherbal gel obtained from plant used to suitably dilute upto the concentrations of 100, 50 and 25 microgram per ml and applied on to the test organism using well diffusion method. Results of the experiment are being concluded in the Table, which clearly shows the anti-acne activity of methanolic extracts of Seeds of Embelia ribes, bark of Acacia nilotica and leaves of Chenopodium album against Propionibacterium acnes bacterial strain used in present work.

*Corresponding Author

Ms. Neha Chopra, Mr. Uday Pratap Singh
Email: nehachoprasop@itmuniversity.ac.in; udaybundela39@gmail.com

Scan QR to visit website

JOURNAL OF PHARMACOLOGY AND BIOMEDICINE

**ISSN No. 2456-8244**

Publication Hosted by
jpbiomed.com

## Introduction

Herbal medicines and their preparations have been widely used traditionally, for the thousands of years in developing and developed countries owing to its natural origin and lesser side effects or dissatisfaction with the results of synthetic drugs. One of the characteristics of oriental herbal medicine preparations is that all the herbal medicines, either presenting as single herbs or as collections of herbs incomposite formulae[1].

Propionibacterium acne on the skin surface, the microbial community is mostly consisted by bacteria belonging to the three main genera of Corynebacterium, Propionibacteria and staphylococci. Propionibacterium acnes belong to the human cutaneous propionibacterium along with Propionibacterium avidum, Propionibacterium granulosum, Propionibacterium innocuum and Propionibacterium propionicum. Historically, P. acnes has been designated as Bacillus acnes and Corynebacterium acnes and Corynebacterium parvum. Acne lesions develop as the result of an inflammatory response to the bacterial colonization of the skin follicles that have become obstructed and swollen with sebum. Propionibacterium acnes bacteria digest triglycerides that are the principle component of sebum and release fatty acids, chemotactic factor, and other molecules that stimulate skin inflammation and the formation of pustules Gels are semisolid dosage forms and are transparent to opaque[2-8]. They contain high ratio of solvent to gelling agent. Gelling agents merge or entangle on dispersing in an appropriate solvent to form a three dimensional colloidal network structure. The fluid flow of solvent molecules by entrapment and immobilization get stopped due to the network.

## Material and Methods

Plant materials Seeds of Embelia ribes, bark of Acacia nilotica and leaves of Chenopodium album were collected from local area of Gwalior (M.P.) in the month of March, 2023. Plant material selected for the study was washed thoroughly under running tap water and then was rinsed in distilled water; they were allowed to dry for some time at room temperature. Then the plant material was shade dried without any contamination for about 3 to 4 weeks. Dried plant material was grinded using electronic grinder. Powdered plant material was observed for their colour, odour, taste and texture.

### Extraction of plant material

Dried powdered of seeds of *Embelia ribes,* bark of *Acacia nilotica* and leaves of *Chenopodium album* has been extracted with methanol using maceration process for 48 hrs, filtered and dried using vaccum evaporator at $40^0$C.

### Determination of percentage yield

The percentage yield of each extract was calculated by using standard formula.

### Phytochemical screening

Phytochemical examinations were carried out for all the extracts as per the standard methods[9-10].

### Estimation of total Phenolic and flavonoid Content

The total phenolic content of the extract was determined by the modified Folin-Ciocalteu method. While determination of total flavonoids content was based on aluminium chloride method.

## Results and Discussion

### Determination of Percentage Yield

The yield of extracts obtained from methanol as solvent are depicted in the table1.

**Table 1. % Yield of methanolic extract**

| S. No. | Extracts | % Yield (w/w) |
|---|---|---|
| 1 | *Embelia ribes* | 6.98 |
| 2 | *Acacia niolitca* | 5.77 |
| 3 | *Chenopodium album* | 7.23 |

### Phytochemical screening of extract

The results of phytochemical studies are discussed in the table 2.

### Total Phenolic content estimation (TPC)

The content of total phenolic compounds (TPC) content was expressed as mg/100 mg of gallic acid equivalent of dry extract sample using calibration curve of gallic acid (Figure 1).

### Total flavanoid content estimation (TFC)

The content of total flavanoid compounds (TFC) content was expressed as mg/100 mg of quercetin equivalent of dry extract sam-

ple using calibration curve of quercetin (Figure 2).

**Table 2. Result of Phytochemical screening of methanol extracts**

| S. No. | Constitutent | *E. ribes* | *A. nilotica* | *C. album* |
|---|---|---|---|---|
| 1 | Alkaloid | -ve | +ve | +ve |
| 2 | Glycoside | -ve | -ve | -ve |
| 3 | Flavonoids | +ve | +ve | -ve |
| 4 | Diterpenes | +ve | +ve | +ve |
| 5 | Phenolics | +ve | +ve | +ve |

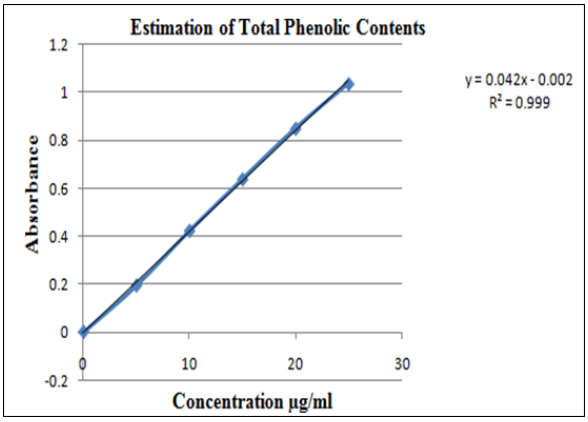


**Figure 1. Graph of Estimation of Total Phenolic content**

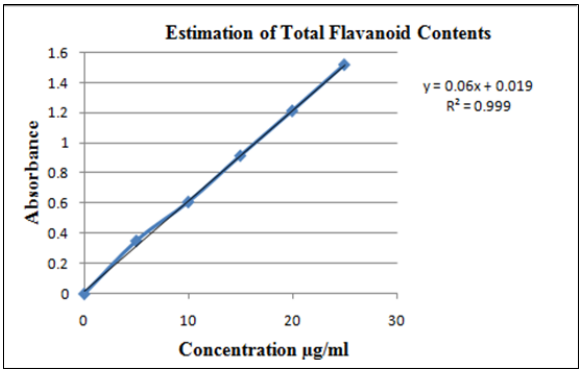


**Figure 2. Graph of Estimation of Total flavonoid content**

The total phenolic content was calculated to be 0.657, 0.916 and 0.788 GAE mg/100mg for *E. ribes*, *A. nilotica* and *C. album* respectively.

The total flavonoid content was calculated to be 0.421 and 0.213 QE mg/100mg for *E. ribes* and *A. nilotica* respectively.

**Evaluation of polyherbal gel formulation**

The physical appearance and characteristics of the gel formulations are presented in table 3. The results show that all formulations were clear, homogenous and had smooth texture.

**Table 3. Psycho-rheological characteristics**

| Formulation | Color | Clogging | Homogeneity | Texture |
|---|---|---|---|---|
| PHG1 | Brown | Absent | Good | Smooth |
| PHG2 | Brown | Absent | Good | Smooth |
| PHG3 | Brown | Absent | Good | Smooth |
| PHG4 | Brown | Absent | Good | Smooth |
| PHG5 | Brown | Absent | Good | Smooth |
| PHG6 | Brown | Absent | Good | Smooth |

The formulations exhibited good washing ability and tube extrudability. The spreadability of the formulations ranged from 9.25 ± 2.10 to 13.25 ± 1.25 g.cm/sec. The optimized formulation (PHG4) displayed spreadability of 10.23 ± 2.36 g.cm/sec (Table 4).

**Table 4. Rheological behavior of polyherbal gel**

| Formulation | Washability | Extrudability | Spreadability (gcm/sec) | pH | Viscosity (cps) |
|---|---|---|---|---|---|
| PHG1 | Good | Good | 13.25±1.25 | 6.92±0.11 | 2865±12 |
| PHG2 | Good | Good | 12.25±1.23 | 6.95±0.15 | 2750±15 |
| PHG3 | Good | Good | 11.23±1.45 | 7.02±0.11 | 2655±14 |
| PHG4 | Good | Good | 10.23±2.36 | 7.02±0.14 | 2610±10 |
| PHG5 | Average | Good | 9.85±2.32 | 7.08±0.12 | 2545±11 |
| PHG6 | Average | Good | 9.25±2.10 | 7.15±0.13 | 2415±14 |

The pH value of the formulations was optimum for application to skin. The viscosity of formulations increased on changing concentration. The viscosity of PHG4 was 2610±10 and was considered optimum.

The drug content in the polyherbal gel formulations was assessed using the total phenolic content value. The highest amount of drug was found to be PHG4 with phenolic content of 2.65 GAE mg/100mg (Table 5).

**Table 5. Phenol content in gel**

| Formulation | % Phenol content (equivalent to gallic |
|---|---|
| PHG1 | 2.45 |
| PHG2 | 2.12 |
| PHG3 | 2.19 |
| PHG4 | 2.65 |
| PHG5 | 2.31 |
| PHG6 | 2.05 |

## Antimicrobial activity of optimized formulation

The present investigation in this research work, the Anti-acne activity of polyherbal gel of Seeds of *Embelia ribes*, bark of *Acacia nilotica* and leaves of *Chenopodium album* were evaluated against *Propionibacterium acnes* pathogens used under present study. The polyherbal gel obtained from plant used to suitably dilute upto the concentrations of 100, 50 and 25 microgram per ml and applied on to the test organism using well diffusion method. Results of the experiment are being concluded in the Table 6, which clearly shows the anti-acne activity of methanolic extracts of Seeds of *Embelia ribes*, bark of *Acacia nilotica* and leaves of *Chenopodium album* against *Propionibacterium acnes* bacterial strain used inpresent work.

**Table 6. Anti-acne activity of standard and polyherbal gel formulation against *Propionibacterium acnes***

| Formula- | 100 mg/mL | 50 mg/mL | 25 mg/mL |
|---|---|---|---|
| Marketed | 18±0.5 | 16±0.94 | 15±0.57 |
| Polyherbal Gel | 20±0.74 | 17±0.5 | 16±0.57 |

## Conclusion

The present study was aimed to developed polyherbal gels for anti-acne treatment using methanolic extracts of *Embelia ribes, Acacia nilotica* and *Chenopodium album* an aqueous based carbopol gel system and evaluated for their physicochemical properties, like pH, spreadability, viscosity and microbial assay. The anti-acne activities of the mentioned gel were more than marketed gel, this needs to be fully clarified by further assay methods and using additional concentrations of extracts. Further phytochemical studies are also required to isolate and characterize active ingredients that are responsible for itsanti acne activity and to explore the existence of synergism if any, among the compounds.

## References


1. Abel Nosereme Agbon, Helen Ochuko-Kwaneshie and Wilson Oliver Hamman, (2013) Antidiarrheal Activity of Aqueous Fruit Extractof Phoenix dactylifera (Date Palm) in Wistar Rats. British Journal of Pharmacology and Toxicology. 4(3): 121-127,.
2. Perry AL, Lambert PA (2006) Propionibacterium Acnes. Lett. Appl. Microbiol. 42(3):185 -188.
3. Webster GF (2005). The Pathophysiology and Principles of Acne Treatment*.3(7):228-233.
4. Kligman AM (2011) Pathogenesis of Acne Vulgaris. Arch. Dermatol. 98(1):53.
5. Khan N, Karodi R, Siddiqui A, Thube S, Rub R (2011) Development of Anti-Acne Gel Formulation of Anthraquinones Rich Fraction from Rubia Cordifolia (Rubiaceae). Int. J Appl. Res. Nat. Prod. 4(4):28-36
6. Diagnostics, 4th rev. ed., W.B Saunders-Philadelphia, 2001.
7. Ch. Muhammad Tahir (2010). Pathogenesis of AcneVulgaris: Simplified. Journal of Pakistan Association of Dermatologists.20: 93-97.
8. Chukwugozie N Okwuosa, Theophilus K Udeani, Joshua E Umeifekwem, Augustine C Onuba, Innocent C Anioke1 and Romanus (2014). E.Madubueze, Hepatoprotective Effect of Methanolic Fruit Extracts of Phoenix dactylifera (Arecaceae) on Thioacetamide Induced Liver Damage in Rats. American Journal of Phytomedicine and Clinical Therapeutics. 2(3): 290-300.
9. Collected from Different Hosts (2013) J Food Process Technol. 4(5): 1-6.
10. Dandopani Chatterjee, Ram K Sahu, Arvind K Jha and Jaya Dwivedi (2011) Evaluation

of Antitumor Activity of Cuscuta Reflexa Roxb (Cuscutaceae) Against Ehrlich Ascites Carcinoma in Swiss Albino Mice. Tropical Journal of Pharmaceutical Research. 10 (4): 447-454.

***Cite this article as***

Chopra N, Singh UP, Tiwari V, Dixit A. Formulation development and evaluation of polyherbal gel of effective treatment of acne. J Pharmacol Biomed. 2024; 8(2): 681-685