



**INTERNATIONAL JOURNAL OF
PHARMACEUTICAL SCIENCES**
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: <https://www.ijpsjournal.com>



Research Paper

Development And Evaluation of Anti Acne Gel Containing Karanja and Brahmi

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ARTICLE INFO

Published: 16 July 2026

Keywords:

Acne vulgaris, Herbal gel, Pongamia pinnata, Bacopa monnieri, Karanja oil, Brahmi extract, Anti-acne formulation, Carbopol gel, Topical drug delivery, In-vitro drug release, ATR-FTIR, Herbal cosmetic

DOI:

10.5281/zenodo.21394059

ABSTRACT

A significant percentage of teenagers and young adults suffer with acne vulgaris, a prevalent chronic inflammatory skin condition. The goal of the current study was to create and assess a topical herbal anti-acne gel that contains Brahmi (*Bacopa monnieri*) and Karanja (*Pongamia pinnata*). Carbopol was used as the gelling agent, triethanolamine as the pH adjuster, propylene glycol as a humectant and penetration enhancer, and methyl paraben as a preservative to create three gel formulations (F1, F2, and F3). A number of physicochemical characteristics, including as color, odor, clarity, homogeneity, pH, viscosity, spreadability, washability, were assessed for the produced formulations. The compositions were compatible with the pH of the skin, as evidenced by their pH range of 5.30 to 5.60. It was discovered that viscosity values ranged from 5.84 to 7.33 cP, which is appropriate for topical application. Spreadability and washability were good in all formulations. Among the prepared batches, formulation F2 showed optimum characteristics with clear appearance, smooth texture, uniform consistency, acceptable viscosity (6.54 cP), and maximum drug release (80.5% at 60 minutes). ATR-FTIR studies confirmed the presence of characteristic functional groups and indicated compatibility between the herbal ingredients and excipients. The results suggest that the developed herbal gel possesses desirable physicochemical properties and may serve as an effective topical formulation for the management of acne due to the antibacterial, anti-inflammatory, and antioxidant activities of Karanja and Brahmi. To determine its safety and therapeutic efficacy, more clinical research is advised.

INTRODUCTION

Gel:

A large percentage of pharmacological dose formulations are semi-solids [1]. Because of their distinct rheological behavior, semi-solids can adhere to the application surface for a sufficient

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Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.



amount of time before being rinsed off ^[2]. About 70–80% of teenagers and young adults suffer with acne vulgaris, a prevalent skin condition. It is a multifactorial pilosebaceous unit illness. The sebaceous gland enlarges and sebum production increases due to the influence of androgens at the start of adolescence. ^[3].

Topical gel administration has the following benefits over alternative dosing forms: avoidance of first-pass metabolism; ease of use and convenience; avoidance of risks and challenges related to intravenous therapy; and avoidance of various absorption conditions, such as pH changes, the presence of enzymes, and the length of stomach emptying ^[4].

Acne

One of the most prevalent skin conditions, acne, affects more than 85% of children ^[5]. The initial lesion known as the "comedo" is the result of a number of variables interacting to cause acne vulgaris (see Image Acne Vulgaris) ^[7]. Though

acne vulgaris is often seen in adolescents, it is not limited to this demographic and can impact people of different ages ^[8]. Acne is caused by a number of factors, including follicular hyperkeratosis, altered sebofollicular microbiota, increased sebum production with raised levels of pro-inflammatory monounsaturated fatty acids, and Th17-cell-mediated inflammatory responses ^[10]. Androgens and insulin-like growth factor-1 (IGF-1) can boost sebum production; IGF-1 promotes the gonadal and adrenal glands' synthesis of these hormones ^[11]. Acne is common in children and teenagers between the ages of 12 and 24, with 15–20% of cases being moderate to severe, though the prevalence varies from study to study ^[12].

The high incidence rates of over 80% in Western countries cannot be explained by acne's heredity alone ^[13]. Dairy products in particular have been held accountable. Milk-derived amino acids stimulate the release of insulin ^[14]. IGF-1 is proposed to be the main factor behind acne, promoting growth of the follicular epithelium ^[15]



Figure 1: Types of acne

TYPES OF ACNE

- ❖ **Comedonal Acne** - Characterized by blackheads and whiteheads; non-inflammatory and mild; results from clogged pores.
- ❖ **Inflammatory Acne** - Characterized by red pustules and papules, it arises from inflammation and a bacterial infection.

- ❖ **Nodulocystic Acne** - Severe; characterized by nodules and cysts; painful and has the potential to cause scarring.
- ❖ **Hormonal (Adult) Acne** - Frequent among women; impacts the chin and jawline; associated with hormones.

❖ **Acne Fulminans** - This is a rare and acute condition of high severity; it can involve fever and joint pain ^[17].

KARANJA:

Plants are a rich source of phytochemicals that can produce maximum healing effects with minimal or no side effects ^[26].

Karanja oil is a naturally occurring, non-edible, semi-drying fixed oil that is made from the seeds of *Pongamia pinnata*, a member of the Fabaceae family. Karanj oil is used to cure psoriasis,

rheumatism, scabies, herpes, leukoderma, and other skin disorders, according to the literature review [28]. Karanja oil can therefore be utilized as an oil phase in ointment formulations to administer poorly water-soluble medications topically, potentially improving absorption and extending drug release ^[29]. Its anti-inflammatory and anti-proliferative properties make it an excellent treatment for arthritis. However, it works well for topical medication delivery in psoriasis because of its low water solubility ^[30].



Figure 2 : Oil of *Pongamia pinnata*



Figure 3 : Seed of *Pongamia pinnata*

BRAHMI

Bacopa monnieri, affectionately referred to as Brahmi, is a water-loving herb widely utilized in Ayurvedic medicine ^[32].

Brahmi (*Bacopa monnieri*) is one such promising botanical, known for its cognitive and healing properties in traditional Ayurvedic medicine. Recent studies have shown its ability to increase

collagen, antioxidant, establishing it as a perfect component for anti-aging skincare ^[33]. This study concentrates on creating and assessing a face mist infused with Brahmi, which aims to hydrate and protect the skin and revitalize it while tackling issues like oxidative stress, inflammation, and early skin aging ^[34]. Collagen is a vital protein that keeps the skin elastic, firm, and hydrated ^[35].



Figure .4 : Flowering stage of Brahmi



Figure .5 :Powder Brahmi

AIM AND OBJECTIVES

AIM : Development and evaluation for anti acne gel containing karanja and brahmi.

OBJECTIVES :

1. **To reduce acne (pimples)** by controlling the growth of acne-causing bacteria.
2. **To reduce skin inflammation and redness** associated with acne.
3. **To control excess sebum (oil) production** on the skin.

4. **To unclog skin pores** and prevent formation of blackheads and whiteheads.
5. **To provide a soothing and cooling effect** to irritated skin.
6. **To promote healing of acne lesions** and improve skin appearance.

Materials and Methodology

Materials

Table 1: Ingredients

Sr no.	Ingredients	Uses
1.	Karanja	Antibacterial, reduces acne
2.	Brahmi	Anti-inflammatory, soothes skin
3.	Carbopol	Form gel, gives thickness
4.	Triethanolamine	Maintains pH, stabilizes gel
5.	Propylene glycol	Helps drug absorption, humectants
6.	Methyl paraben	Preservatives
7.	Purified water	Vehicle

METHODOLOGY

Accurately weigh all the ingredients → Brahmi Powder, Karanja Oil, Tween 80, Carbopol, distilled water, and Triethanolamine.



Prepare the aqueous phase → Disperse Carbopol in distilled water.



Stir the Carbopol dispersion using a magnetic stirrer for 1 hour.



Keep the dispersion aside for 24 hours for complete swelling of Carbopol.



Prepare the extract phase → Take Brahmi powder, add water, and heat on a water bath for 20 minutes.



Cool the prepared extract and filter it properly.



Prepare the oil phase → Take Karanja oil, To get a homogenous mixture, add Tween 80 and thoroughly mix.



Add the filtered extract phase into the swollen Carbopol gel base with continuous stirring.



Add the oil phase slowly into the gel while stirring continuously to form a uniform gel.



Adjust the pH by adding Triethanolamine dropwise and maintain the pH between 4.5–6.5.



Add distilled water to the final volume and thoroughly mix



Final product



Transfer the prepared gel into a suitable container, label properly, and store safely



Figure : 6

FORMULATION TABLE (drug content)**Table 2 : Formulation table**

Sr. no.	Ingredients	F1	F2	F3
1.	Karanja	0.1g	0.3g	0.2g
2.	Brahmi	0.1g	0.2g	0.15g
3.	Carbopol	1g	1g	1g
4.	Triethanolamine	q.s	q.s	q.s
5.	Propylene glycol	0.1g	0.1g	0.1g
6.	Methyl paraben	0.2g	0.2g	0.2g
7.	purified water	q.s	q.s	q.s
8.	Total (g/ml)	10.0	10.0	10.0

RESULT AND DISCUSSION:**Physical parameter:****Table 3 : Evaluation test results**

Sr no.	Parameter	Batch F1	Batch F2	Batch F3
1.	Color	White	Light yellow	Light yellow
2.	Odor	Mild herbal	Pleasant herbal	Slightly strong herbal
3	Clarity	Slightly turbid	Clear	Clear
4	Consistency	Slightly thin	Smooth & optimum	Thick
5	Homogeneity	Less uniform	Uniform	Uniform
6	Lumps	Few lumps present	No lumps	No lumps
7	Air bubbles	Few present	Absent	Slightly present

pH parameter:

A calibrated digital pH meter was employed to determine the produced gel's pH, and the readings were documented.





Figure 7 : pH of gel

Table 4 : pH of formulation

Sr no.	Formulation	Ph
a.	F1	5.30
b.	F2	5.47
c.	F3	5.60

VISCOCITY

The gel's viscosity was assessed using an Ostwald viscometer, and the resulting data were documented.

Formula for viscosity calculation:

$$\eta_2 = \eta_1 \times p_2 t_2 / p_1 t_1$$

where,

η_1 = viscosity of water

η_2 = viscosity of gel

p_1 = density of water

p_2 = density of gel

t_1 = flow time of water

t_2 = flow time of gel



Figure 8 : viscosity of gel

Table No 5 : viscosity of formulation

Sr no.	Formulation	Viscosity
1.	F1	5.84 cP
2.	F2	6.54 cP
3.	F3	7.33 cP

Spreadability

The formulated gel's spreadability was assessed at room temperature. The spreadability results were discovered to be as follows for each gel composition.



Figure 9 : Spreadability of gel

Table No 6 : Spreadability of formulation

Sr no.	Formulation	spreadability
1.	F1	Easily Spreadable
2.	F2	Easily Spreadable
3.	F3	Easily Spreadable

Washability

A small quantity of facial scrubbing was used on the skin and rinsed off with water. The washing was simple.

Homogeneity

In order to verify that the parts were dispersed uniformly throughout the product, the gel's homogeneity was evaluated visually and through touch.

Drug Release

In-vitro drug release study of anti-acne gel three batches of gel compositions were completed using diffusion membrane apparatus :



Figure 10 : Drug release

Table No 7 : Drug release profile

Sr. No.	Time (min)	F1	F2	F3
1.	15	19.8%	23.6%	17.4%
2.	30	37.5%	44.8%	33.2%
3.	45	55.1%	62.7%	49.3%
4.	60	71.2%	80.5%	65.85

FTIR

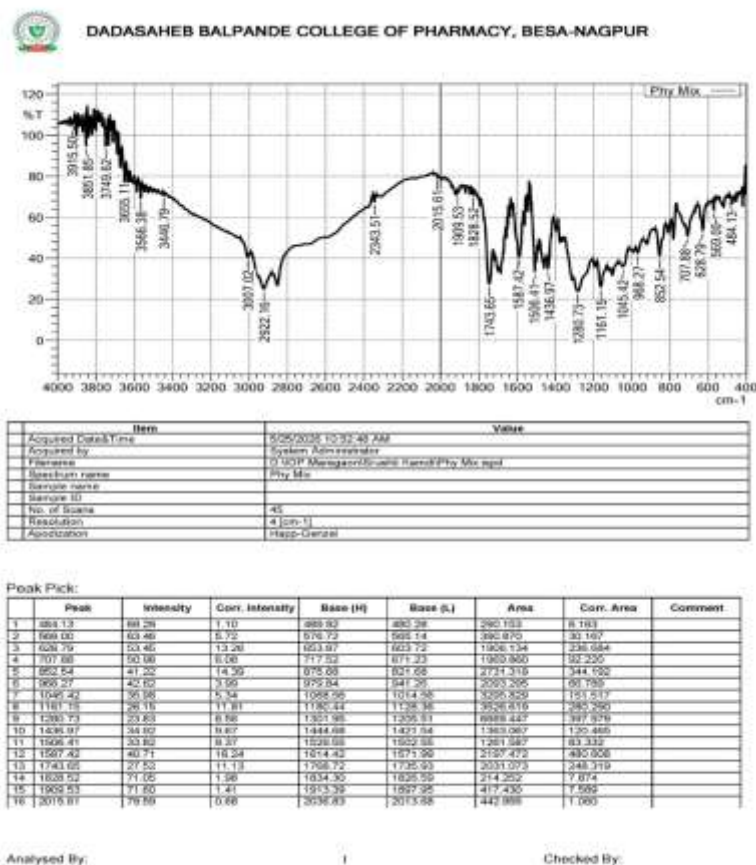


Fig.11 : ATR – FTIR Spectra interpretation of Anti acne gel Showing characteristics functional group



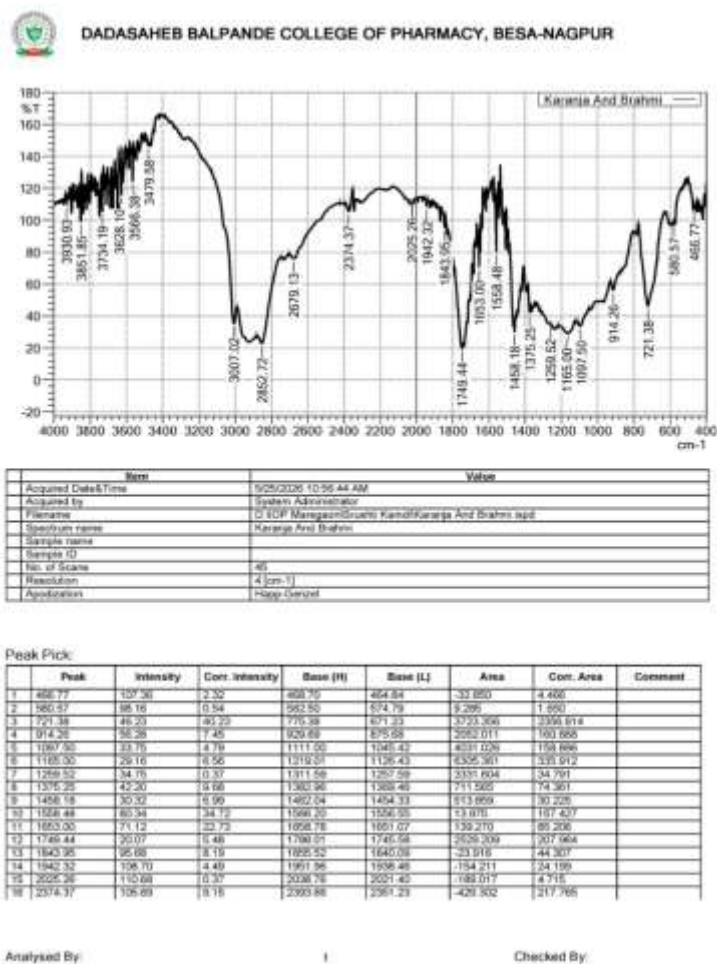


Fig.12 :-ATR – FTIR Spectra interpretation of Karanja & Brahmi Showing characteristics functional group.

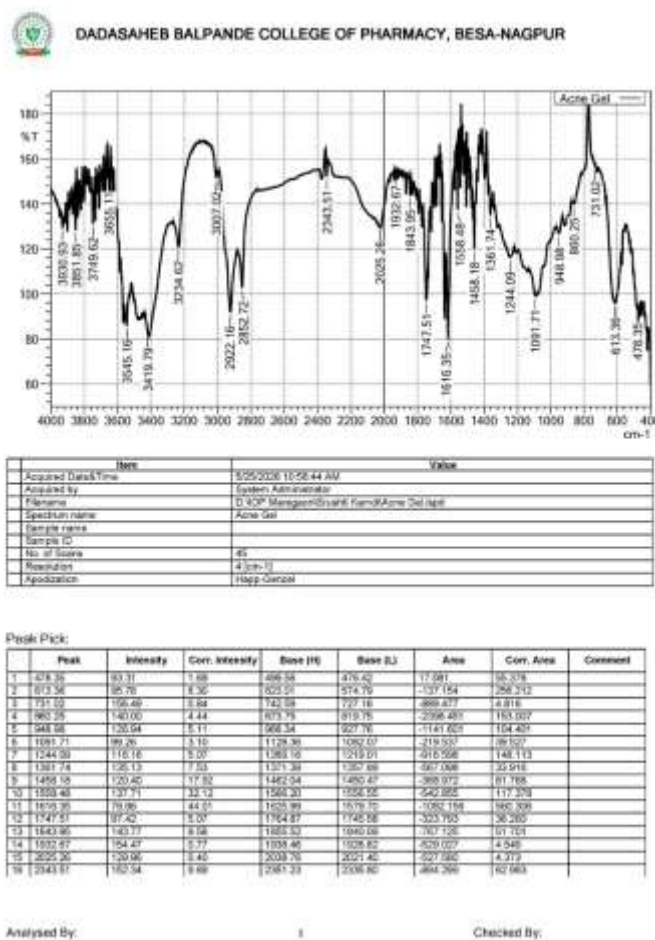


Fig. 13 :-ATR – FTIR Spectra interpretation of Anti acne gel Showing characteristics functional group.

CONCLUSION

The present study successfully formulated and evaluated an herbal anti-acne gel using *Pongamia pinnata* and *Bacopa monnieri*. Three formulations (F1, F2, and F3) were developed and assessed for their physicochemical properties.

Among all formulations, Batch F2 was identified as the optimized formulation due to its ideal pH, optimum viscosity, good spreadability, smooth texture, and uniform consistency. The results indicate that the formulated gel is stable, easy to apply, and suitable for topical use.

The presence of bioactive constituents in *Karanja* and *Brahmi* suggests potential antibacterial, anti-inflammatory, Its antioxidant properties, which

could in reducing acne lesions and improving skin condition.

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HOW TO CITE: Srushti Kamdi, Anshika Bhati, Khushal Darunkar, Dr. Nilesh Chachda, Development And Evaluation of Anti Acne Gel Containing Karanja and Brahmi, Int. J. of Pharm. Sci., 2026, Vol 4, Issue 7, 4012-4023, <https://doi.org/10.5281/zenodo.21394059>

