



Phytochemical Screening And In Vivo Evaluation of Anti-Acne Activity of *Viola odorata* Leaf Extract: A Research Paper

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Abstract: *Viola odorata*, commonly known as sweet violet, is recognized for its various therapeutic potentials, including anti-inflammatory and antimicrobial effects. This study investigates the phytochemical composition and in vivo anti-acne activity of ethanol-extracted *Viola odorata* leaves in Wistar rats. Phytochemical screening confirmed the presence of flavonoids, tannins, alkaloids, and phenolic compounds. Acne was induced using *Propionibacterium acnes*, and lesion scores were evaluated. The results demonstrate significant anti-acne activity, especially at higher doses, comparable to standard clindamycin treatment.

Keywords: *Viola odorata*, Anti-acne activity, Phytochemical screening, Maceration extraction, *Propionibacterium acnes*, Wistar rats, Herbal medicine, Ethanolic extract, In vivo study, Lesion scoring

Introduction

Acne vulgaris is a common inflammatory skin disease associated with follicular hyperkeratinization, bacterial colonization, and sebum overproduction. Traditional treatments include topical antibiotics, but resistance and side effects are major concerns. *Viola odorata* has been traditionally used for skin ailments. This study explores its anti-acne potential via phytochemical screening and in vivo evaluation.

Etiology and Pathogenesis

Acne is multifactorial in origin and involves the following key pathogenic events:

1. Hyperkeratinization: Abnormal shedding of keratinocytes leads to blockage of hair follicles.
2. Increased Sebum Production: Stimulated by androgens, sebaceous glands overproduce sebum, creating an oily environment.
3. Colonization by *Cutibacterium acnes*: Formerly known as *Propionibacterium acnes*, this anaerobic bacterium proliferates in the sebum-rich environment and triggers immune responses.
4. Inflammation: Bacterial metabolites and host immune response cause inflammation, leading to papules, pustules, nodules, or cysts.



Clinical Features

Comedones (open and closed)

Papules and pustules

Nodules and cysts (in severe cases)

Typically found on the face, chest, and back

Types of Acne

Comedonal Acne: Non-inflammatory (blackheads and whiteheads)

Inflammatory Acne: Papules, pustules, nodules

Nodulocystic Acne: Severe form with scarring

Acne Conglobata: Rare, severe, with interconnected abscesses

Plant Profile of *Viola odorata***Introduction**

Viola odorata is a small perennial herb known for its fragrant flowers and medicinal properties. It is native to Europe and Asia, found widely in the temperate regions of India such as Jammu & Kashmir and Himachal Pradesh. It contains phytoconstituents like flavonoids (quercetin, kaempferol), alkaloids, tannins, saponins, glycosides, and essential oils, making it useful in treating respiratory disorders, skin infections, and inflammation.

**Scientific Classification**

Botanical name: *Viola odorata* Linn.

Family: Violaceae

Common names: Sweet Violet, Banafsha, Garden Violet

Hindi name: Banafsha

Sanskrit name: Banaphsha

Parts used: Flowers, leaves, roots

Botanical Description

Habit: Perennial herb

Height: 10–15 cm

Leaves: Heart-shaped, dark green with serrated margins

Flowers: Violet or purple in color, highly fragrant, borne singly on leafless stalks

Root: Creeping rhizome

Geographical Distribution

Native to Europe and Asia

Widely cultivated in temperate zones



In India, commonly found in Jammu & Kashmir, Himachal Pradesh, and Uttarakhand

Phytochemical Constituents

Flavonoids: Quercetin, kaempferol derivatives

Alkaloids: Odoratinine

Glycosides: Viola-quercitrin

Saponins, tannins, mucilage, and essential oils

Traditional Uses

Treatment of respiratory disorders (cough, cold, bronchitis)

Antipyretic, expectorant, demulcent

Used in traditional Unani and Ayurvedic formulations

External application for skin ailments and inflammation

Pharmacological Activities

Antimicrobial

Anti-inflammatory

Antioxidant

Antipyretic

Wound healing

Expectorant

Proposed Mechanism of Action

The anti-acne activity of *Viola odorata* is attributed to a combination of phytochemical constituents and their interaction with key pathological features of acne. The proposed mechanism involves the following pathways:

1. Antimicrobial Action

Flavonoids, alkaloids, and tannins in the extract are known to exhibit broad-spectrum antimicrobial activity.

These constituents likely inhibit the growth of *Cutibacterium acnes* by disrupting microbial cell walls, reducing colonization and subsequent inflammation.

2. Anti-Inflammatory Effect

Phytoconstituents such as flavonoids and saponins downregulate the production of pro-inflammatory cytokines like IL-1 β , TNF- α , and IL-6.

This reduces redness, swelling, and infiltration of inflammatory cells in the pilosebaceous units.

3. Antioxidant Activity

Reactive oxygen species (ROS) contribute to acne-related inflammation.

Antioxidant phytochemicals in *Viola odorata* neutralize ROS, protecting skin cells from oxidative stress and promoting healing.

4. Astringent and Sebum-Modulating Properties

Tannins exhibit astringent properties that help in pore tightening and sebum regulation.

Reduced sebum production leads to less clogging of follicles and lower chances of comedone formation.

5. Wound Healing Support

The extract may enhance re-epithelialization and collagen synthesis, accelerating the repair of acne lesions.

In Vivo Studies section for your thesis on *Viola odorata*:

Table 1: Phytochemical Screening of *Viola odorata* Leaf Extract

Phytochemical Test	Result
Alkaloids (Mayer's Test)	Present
Flavonoids (Alkaline Test)	Present
Tannins (Ferric Chloride)	Present
Saponins (Foam Test)	Present
Glycosides (Keller Killiani)	Present



Phenolic Compounds	Present
Terpenoids (Salkowski Test)	Present
Steroids (Liebermann Test)	Present

Materials And Methods

1. Collection and Identification: Fresh leaves of *Viola odorata* were collected and authenticated. The plant is collected from local habitant of Balaghat m. p Identified and authenticated by botonist Dr. Saba Naaz department of Botany Saifia science collage Bhopal m.p. India
2. Extraction: Leaves were shade-dried, powdered, and extracted using maceration with ethanol.
3. Phytochemical Screening: Tests for alkaloids, flavonoids, tannins, saponins, glycosides, etc., were conducted.
4. In Vivo Study: Acne was induced in Wistar rats using *P. acnes*. Animals were divided into five groups (normal, disease control, standard, and two extract dose groups). Lesion severity was assessed on Days 7 and 14.
5. Statistical Analysis: Data analyzed using ANOVA and p-values <0.05 considered significant.

Experimental Details

Acne Induction Protocol

Bacterial Agent: Cutibacterium acnes (formerly Propionibacterium acnes)

Preparation: Bacterial suspension (10^8 CFU/mL) prepared in phosphate-buffered saline

Method: Intradermal injection of 0.05 mL bacterial suspension into the shaved dorsal skin

Incubation Period: 24–48 hours to allow development of inflammatory acne lesions

Experimental Animals

• **Animal model:** Wistar albino rats (150–200 g)

• **Source:** Institutional animal facility

Housing Conditions: 12-h light/dark cycle, temperature $25 \pm 2^\circ\text{C}$, standard feed and water ad libitum

Grouping of Animals

Group Treatment Number of Animals

I Control (base only)	6
II Standard (Clindamycin)	6
III Viola Extract – Low Dose	6
IV Viola Extract – High Dose	6

Evaluation Parameters

- Lesion diameter
- Erythema and edema scoring

Results

Phytochemical screening confirmed the presence of multiple active constituents. In vivo studies revealed significant improvement in lesion scores in extract-treated groups.

Group	Treatment	Lesion Score (Day 7)	Lesion Score (Day 14)
Normal Control	No induction	0.00 ± 0.00	0.00 ± 0.00
Disease Control	<i>P. acnes</i> only	3.80 ± 0.20	4.10 ± 0.25
Standard	Clindamycin	2.10 ± 0.15	1.20 ± 0.10
Low Dose	200 mg/kg extract	2.80 ± 0.18	1.90 ± 0.15
High Dose	400 mg/kg extract	2.30 ± 0.12	1.10 ± 0.08



Discussion

The anti-acne effect of *Viola odorata* extract can be attributed to its rich phytochemical content, notably flavonoids and tannins which have anti-inflammatory and antibacterial actions. The significant reduction in lesion scores, particularly in the high-dose group, supports its potential as an alternative acne therapy.

Conclusion

Ethanollic extract of *Viola odorata* leaves exhibited significant anti-acne activity in rats, supporting its use in traditional medicine. Further clinical evaluation and formulation development is warranted.

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