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Research Article

**FORMULATION AND EVALUATION OF ANTI -ACNE GEL OF  
TABERNAEMONTANA DIVARICATE****Vijendra Bhabhore, Dr. Vivekanand Katare\*<sup>1</sup>, Ms. Sadhna Mangrole<sup>1</sup>,  
Dr. Prabhat Kumar Jain<sup>2</sup>**<sup>1</sup>Vivekanand College of Pharmacy, Bhopal (M.P.), <sup>2</sup>Scan Research Laboratories, Bhopal (M.P.)**Article Received:** December 2022 **Accepted:** December 2022 **Published:** January 2023**Abstract:**

*Acne, as a family of skin disorders is one of the most prevalent dermatologic diseases in the world. It usually affects almost everybody during the life. The use of natural remedies, particularly herbal medicine, dates back thousands of years. Over the last decade, in view of increasing resistance to existing anti-microbial agents, side effects and sometimes high cost of treatment, interest in medicinal herbs has been progressively increased. The plant Tabernaemontana divaricata, is an evergreen shrub or small tree native to South Asia, Southeast Asia and China. The root is used to treat hypertension, headaches, scabies, and toothaches. The roots, leaves, and flowers are all used to treat snake and scorpion poisoning. Non-medical uses include using the wood as incense and perfume or using the pulp around the seed to make red dyes. This study aims to evaluate the gel of Tabernaemontana divaricate for its antimicrobial effect against P.acne. the leaves of this plant is collected & subjected to successive extraction, extractive value & Phytochemical tests . The gel was then prepared and analyzed for various parameters including antimicrobial effect. The antimicrobial effect of extract was evaluated by well diffusion method. The results showed that yields were found to be 8.24g for aqueous extract. The phytochemicals like terpenoids, phenols, Carbohydrates, Flavonoids were found to be present. The Colour of formed gel was Brown with good homogeneity & consistency. The pH of gel was 6.8. The Spreadibility was 31(gm.cm /sec). The Extrudability was 548 and Viscosity (CPS) was observed as 36.6. The zone of inhibition for 100 mg/ml of extract was found to be 12±0.2mm against P. acne*

**Keywords:** *Tabernaemontana divaricate, P.acne, gel, Anti- microbial activity***Corresponding author:****Vivekanand Katare,**

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QR code



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**INTRODUCTION:**

Acne, as a family of skin disorders is one of the most prevalent dermatologic diseases in the world. It usually affects almost everybody during the life. The pathogenesis of acne is complex but dependent on four key factors including androgen-mediated stimulation of sebaceous gland activity, follicular hyperkeratinization, colonization of the bacterium *Propionibacterium acnes* (an anaerobic bacterium as a normal constituent of the skin microbial flora), and inflammation (Toyoda and Morohashi, 2001; Feldman *et al.*, 2004)

The high levels of sebum elicited by androgen cause proliferation of *P. acnes* in the pilosebaceous ducts and this proliferation triggers the host inflammatory response with a discharge of the proinflammatory cytokines, interleukin-1b (IL-1 b), IL-8, granulocyte-macrophage colony-stimulating factor (GM-CSF), tumor necrosis factor  $\alpha$  (TNF- $\alpha$ ) and complement deposition. (Oprika, 2006) In addition to *P. acnes*, as the main causative microorganism, *Pityrosporum ovale* and *Staphylococcus epidermidis* are present in acne lesions. There are 3 types of acne: comedonal, nodular, and papulopustular. Comedonal is non-inflammatory while nodular and papulopustular are the inflammatory type (Kumar *et al.*, 2007; Baser *et al.*, 2006)

The use of natural remedies, particularly herbal medicine, dates back thousands of years. Over the last decade, in view of increasing resistance to existing anti-microbial agents, side effects and sometimes high cost of treatment, interest in medicinal herbs has been progressively increased (Chomnawang *et al.*, 2005)

*Tabernaemontana divaricata*, commonly called pinwheel flower, crape jasmine, East India rosebay, and Nero's crown, is an evergreen shrub or small tree native to South Asia, Southeast Asia and China. In zones where it is not hardy it is grown as a house/glasshouse plant for its attractive flowers and foliage. The stem exudes a milky latex when broken, whence the name milk flower. The root is used to treat hypertension, headaches, scabies, and toothaches. The roots, leaves, and flowers are all used to treat snake and scorpion poisoning. Non-medical uses include using the wood as incense and perfume or using the pulp around the seed to make red dyes. The present study deals with deciphering the anti-acne activity of *Tabernaemontana divaricate*.

**MATERIAL AND METHODS:****Collection of plant:**

The leaves of selected plant namely *Tabernaemontana divaricata* (Leaves) was purchased from Moolchand Phoolchand herbal store, Bhopal, Madhya Pradesh. The entire plant drug was authenticated by expert botanist of Department of Botany Safiya College Bhopal. All collected plant drug were cleaned, shade dried, pulverized into moderately coarse powder and stored in airtight container for further use.

**Successive Solvent Extraction:**

The Collected plant drug (Leaves) was cleaned properly and washed with distilled water to remove any kind of dust particles. Cleaned and dried plant drug was converted into moderately coarse powder in hand grinder. Powdered plant drug was weighed (250 gm) and packed in Soxhlet apparatus.

The plant Material (Leaves) was extracted with water (40°-60°C) for about 12 hrs. The Aqueous extracts were collected in a tarred conical flask. The solvent removed by drying on hot plate. The extracts obtained with each solvent were weighed to a constant weight and percentage w/w basis was calculated.

**Phytochemical screening:**

Preliminary phytochemical screening means to investigate the plant material in terms of its active constituents. In order to detect the various constituents present in the different extracts of *Tabernaemontana divaricata*, was subjected to the phytochemical tests as per standard methods.

**Preparation of gel:**

The weighted amount of Methyl Paraben was dissolved in 5 mL of hot water, and propylparaben was added on slight cooling of water. To this beaker carbopol 934 was dispersed with continuous stirring for 20 minutes after addition of 50 mL of distilled water. This dispersion was kept overnight for soaking. In another beaker, the required quantity of propylene glycol and polyethylene glycol 400 were added. This mixture along with the concentration of aqueous extract corresponding to its MIC was incorporated to carbopol beaker with stirring. The volume was made up with distilled water, and stirring was done vigorously. Triethanolamine was added from the gel by adjusting pH to 6.8.

**Table 1: Formulations prepared with this ingredients along with quantity**

Ingredients	Quantity
<i>Tabernaemontana divaricata</i> extract	1 gm
Carbopol 934	1 gm
Methyl Paraben (0.5%)	0.2 ml
Propyl Paraben (0.2%)	0.1 ml
Propylene glycol 400(5%)	5 ml
Triethanolamine (q.s)	1.2 ml
Distilled water	Upto 100 ml

**Physical appearance:**

The physical appearance of the formulation was checked visually which comprised

**Color:**

The color of the formulation was checked out against white background.

**Consistency:**

The consistency was checked by applying on skin.

**Greasiness:**

The greasiness was assessed by the application onto the skin.

**Odor:**

The odor of the gels was checked by mixing the gel in water and taking the smell.

**pH:**

An amount of 20 mg of the formulation was taken in a beaker and was subjected to the pH measurement using a digital pH meter within 24 hrs of manufacture

**Viscosity:**

Viscosities of formulated gels were determined using Brookfield viscometer spindle # 7 at 50 rmps and 25°C. The corresponding dial reading on the viscometer was noted. Then the spindle was lowered successively.

**Extrudability:**

Extrudability is defined as the weight in grams required for extruding 0.5 cm long ribbon of formulation in 10 seconds. The gel formulation was filled in a standard capped collapsible aluminum tubes and sealed by crimping to the end. The tubes were placed between two slides and were clamped. 50 g weight was placed over the slides, and then the cap was removed. The length of the ribbon of the formulation that came out in 10 seconds was recorded (Sawarkar *et al.*, 2010).

**Spreadability:**

An amount of 50 mg of the formulation was sandwiched between the two slides, each with dimensions of 6 cm × 2 cm. A weight of 50 mg was placed upon the upper slide so that the formulation between the two slides get pressured uniformly to form a thin layer. The weight was removed, and the excess of the formulation adhering to the slides was scrapped off. The lower slide was fixed on the board of apparatus, and the upper slide was held to the non-flexible string to which 20g load was applied with the help of a simple pulley which was in horizontal level with the fixed slide. The time taken by the upper slide to slip off the lower slide was noted.

**Anti-microbial activity:**

The antibacterial activity was tested by well diffusion method. The culture of *P. acne* was tested for antimicrobial effect of plant extract. Test samples of this aerobic bacterium were incubated at 37°C for 24 hrs under aerobic conditions. The antibacterial activity was estimated by measuring the diameter of the zone of inhibition

**RESULTS & DISCUSSION:**

The results showed that yields were found to be 8.24g for aqueous extract. The phytochemicals like terpenoids, phenols, Carbohydrates, Flavonoids were found to be present. The Colour of formed gel was Brown with good homogeneity & consistency. The pH of gel was 6.8. The Spreadability was 31(gm.cm/sec). The Extrudability was 548 and Viscosity (CPS) was observed as 36.6. The zone of inhibition for 100 mg/ml of extract was found to be 12±0.2mm against *P. acne*

**Table 2: Extractive values obtained from *Tabernaemontana divaricata* Leaves**

S.N.	Solvent	Time of Extraction (Hours)	Color of extract	Yield	% Yield
1	Water (Aqueous)	18	Dark Brown	8.24gm	8.24%

**Table 3: Preliminary phytochemical screening of *Tabernaemontana divaricata* Leaves**

S. No.	Phytoconstituents	Test Name	Hydroalcoholic Extract
1	Alkaloids	Hanger's Test	-
	Tannins	Gelatin Test	-
2	Glycosides	Leigel's test	-
3	saponins	Froth test	-
4	terpenoids	Salwaski's test	+
5	phenols	Ferric chloride test	+
6	Carbohydrates	Gelatin Test	+
7	Flavonoids	Lead acetate	+
8	Proteins & Amino acids	Precipitation test	-

**Table 4: Physical evaluation of formulation at the time of gel formulation.**

Formulation	<i>Tabernaemontana divaricata</i> gel
Colour	Brown
Homogeneity	Homogenous
Ph	6.8
consistency	good
Spreadibility (gm.cm/sec)	31
Extrudability	548
Viscosity (CPS)	36.6

**Table 5: Antimicrobial activity of *Tabernaemontana divaricata* gel against selected microbes**

S. No.	Name of microbes	Zone of inhibition		
		25mg/ml	50 mg/ml	100mg/ml
1.	<i>p.acne</i>			
	<i>Tabernaemontana divaricata</i> gel	8±0.5	10±0.3	12±0.2

**CONCLUSION:**

In this study the various phytochemical are present such as Phenols, Flavonoids Carbohydrates etc. The TLC profile of the plant extract shows the presence of flavonoids when compare with the standard (Quercetin). The herbal anti acne gel prevented effectively the growth of both Gram-positive bacteria which responsible to cause *A. vulgaris*. The obtained results indicated that Antimicrobial activities of the herbal anti acne gel were positively associated with the Phytochemicals present in the herbal gel.

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