# Formulation and evaluation of anti-acne gel containing *Abutilon indicum*

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***Abstract*—Acne vulgaris is a chronic inflammatory disorder characterized by microbial proliferation, excess sebum secretion, and oxidative stress. Pharmacognostic evaluation was carried out to authenticate and standardize the plant material. Network pharmacology analysis were performed to identify the role of bioactive phytoconstituents of the plant in combating inflammatory, immune response, and production of reactive oxygen species pathways associated with acne. The ethanol extract of the leaf the plant was prepared and evaluated for in vitro free radical scavenging activity (DPPH method). Further, the extract was incorporated into a topical gel and evaluated for physicochemical parameters including pH, viscosity, spreadability, homogeneity, and stability. The formulated gel exhibited satisfactory pharmaceutical characteristics. These findings suggest that the ethanol extract of *Abutilon indicum* based gel possesses promising anti-acne activity and may serve as a safer herbal alternative for topical acne management. It is Cost-effective, easily accessible and Suitable for long-term use.**

***Index Terms*—*Abutilon indicum*, Ethanol leaf extract, Pharmacognostic evaluation, Herbal gel.**

## I. INTRODUCTION

Acne is a common dermatological condition. Acne vulgaris is mostly induced by Propionibacterium acnes during adolescences and is

*Fig.1 Abutilon indicum*

associated with the normal circulation of Dehydro–Epiandrosterone (DHEA) [1] [2]*Abutilon indicum (L.)* Sweet is commonly known as Indian Mallow. It belongs to the family Malvaceae. [3]. The plant is widely distributed throughout tropical and subtropical region of India and is extensively used in Ayurveda, Siddha, Unani and folk medicine for its anti-bacterial, anti-inflammatory and wound-healing properties. [4]

Table 1: Synonyms of *Abutilon indicum* in different system of medicine

| S. No | Medicinal System | Synonyms of Plant |
|---|---|---|
| 1 | Ayurveda | Atibala, Balika, Rishyaprokta, Kankatika |
| 2 | Siddha | Thuthi, Thuthi keerai |
| 3 | Unani | Kanghi, Ban-kapas |
| 4 | Homeopathic | Abutilon indicum, Indian mallow |

## II. MATERIALS AND METHODS

The leaves of *Abutilon indicum Linn* sweet belonging to the family Malvaceae were collected from in and around of Chithamur village, Melmaruvathur, Chengalpattu district of Tamil Nadu. The collected plant material was authenticated by a qualified botanist at the Department of Medicinal Botany, National Institute of Siddha, Tambaram-Sanitorium, Chennai.

## III. PREPARATION OF PLANT EXTRACT

Sufficient quantity of 95% ethanol was added to the accurately weighed powdered leaves to completely immerse the powdered material and kept at room temperature for a period of 72 hours with intermittent shaking. the extract was filtered using muslin cloth followed by Whatman No. 1 filter paper to remove marc.The residue was pressed gently to recover the maximum amount of extract. The filtrate obtained was concentrated under water bath. The concentrated extract was further air dried to obtain a semi-solid mass.

## IV. NETWORK PHARMACOLOGY ANALYSIS OF ANTI-ACNE ACTIVITY

1. Collection of active phytochemicals present in plant.

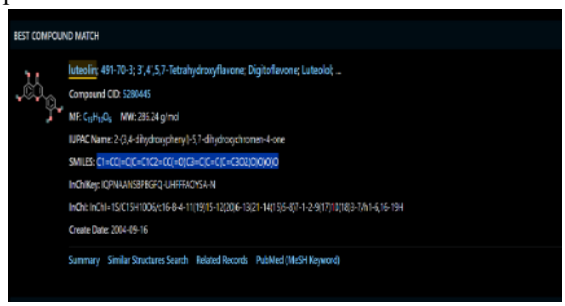


Fig.2 Smiles format

2. Prediction of potential targets

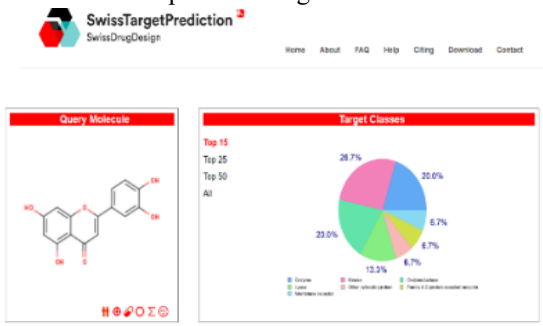


Fig.3 Swiss target prediction

3. Identification of acne-related

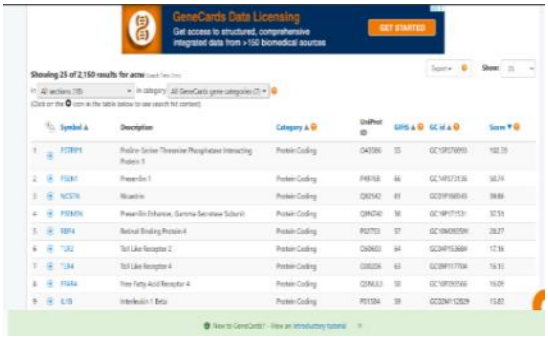


Fig.4 Gene cards database

4. Identification of common targets

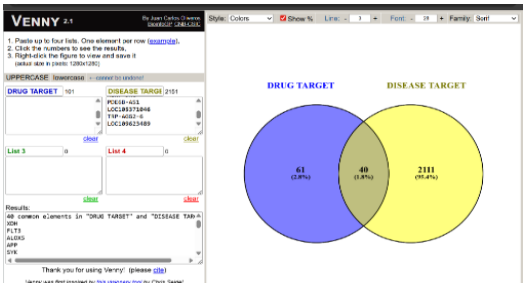


Fig.5 Venn diagram

5. String database:

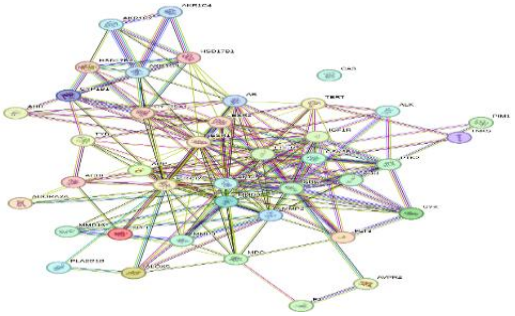

Fig.6 String database

6. Network construction

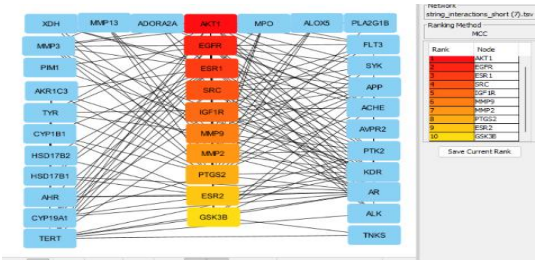


Fig.7 Cytoscape

7.ShinyGO 0.77:

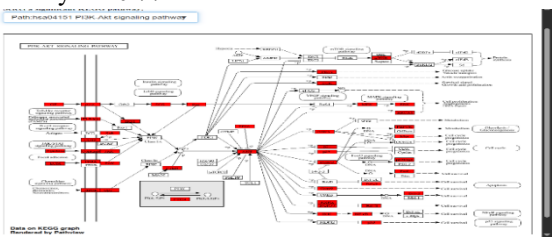


Fig.8 P13K-AKT signaling pathway

Mechanism interpretation:

The constructed network was analyzed to determine: Luteolin contributing to anti-acne activity. Hub target genes involved in acne pathogenesis. Potential modulation of inflammatory pathways, sebaceous gland activity, and keratinocyte proliferation. This integrative approach helped to elucidate the multi-target therapeutic mechanism of the luteolin against acne vulgaris.

## V. PHARMACOGNOSTIC EVALUATION

Table 2: Organoleptic characteristics of powder of Abutilon indicum:

| S. No | Organoleptic characteristics | Observation |
|---|---|---|
| 1. | Colour | Light green |
| 2. | Odour | Distinctive and faint |
| 3. | Taste | Mild sweet and mucilaginous |

| | | |
|---|---|---|
| 4. | Texture | Smooth, soft and slightly fibrous |
| 5. | Consistency | Light weight and fluffy |

Table 3: Physicochemical parameters of powder of *Abutilon indicum* [5]

| S. No | Physicochemical parameters | results |
|---|---|---|
| 1) | Total ash | 7.2% w/w |
| 2) | Acid insoluble ash | 0.9% w/w |
| 3) | Water soluble ash | 2.2% w/w |
| 4) | Loss on drying | 5.5% w/w |
| 5) | Foaming index | 100 |

Table 4: Fluorescence analysis of leaves of *Abutilon indicum* powder [6]

| S. No | Treatment | Visible light | Wavelength | |
|---|---|---|---|---|
| | | | UV short | UV long |
| 1. | Powder+Conc. Hcl | green | green | dark green |
| 2. | Powder+Conc. $H_2SO_4$ | greenish black | dark brown | greenish black |
| 3. | Powder+Conc. $HNO_3$ | dark brown | light yellow | orange |
| 4. | Powder+ acetone | brown | brown | red |
| 5. | Powder+5% iodine | green | light green | green |

## VI. SOLUBILITY OF THE EXTRACT OF LEAVES OF *ABUTILON INDICUM*

Table .5

| S.No | Medium | Extract |
|---|---|---|
| 1. | Distilled water | Soluble |
| 2. | Ethanol | Soluble |
| 3. | Propylene glycol | Soluble |
| 4. | Chloroform | Partially soluble |

## VII. ANTIOXIDANT ACTIVITY - DPPH FREE RADICAL SCAVENGING ASSAY

The DPPH (2, 2-Diphenyl-1-picrylhydrazyl) assay is a simple and rapid method used to evaluate the antioxidant potential of plant extracts. DPPH is a stable free radical that exhibits a deep violet color with maximum absorbance at 517nm. In the presence of antioxidant compounds in the extract, DPPH radicals are reduced by hydrogen or electron donation, resulting in a decrease in absorbance. The degree of discoloration indicates the scavenging potential of the extract. [7] [8]

Table 6: Antioxidant activity of *Abutilon indicum* leaf extract

| S.No | Concentration (mg/ml) | % inhibition of DPPH | |
|---|---|---|---|
| | | Leaf extract | Ascorbic acid |
| 1. | 1 | 22 | 33 |
| 2. | 10 | 36 | 45 |
| 3. | 20 | 46 | 57 |
| 4. | 30 | 61 | 73 |
| 5. | 40 | 68 | 80 |
| 6. | 50 | 72 | 89 |
| 7. | 60 | 80 | 97 |

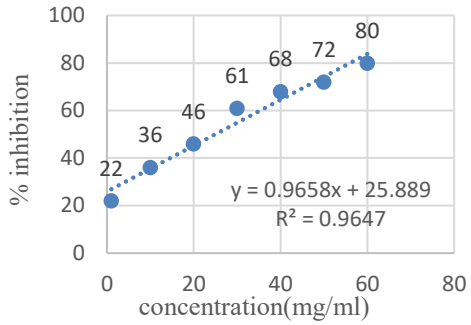


Fig.9 Inhibition % of DPPH radical scavenging activity of plant extract

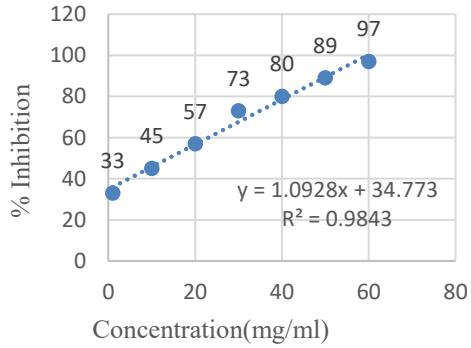


Fig.10 Inhibition % of DPPH radical scavenging activity of Ascorbic acid

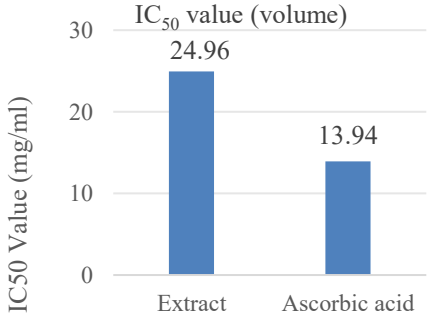


Fig.11 $IC_{50}$ Value of Extract and Ascorbic acid

## VIII. FORMULATION CHART FOR THE PREPARATION OF *ABUTILON INDICUM* ANTI-ACNE GEL

Table 7:

| S. No | Ingredients | F(1) 1% | F(2) 2% | F(3) 3% |
|---|---|---|---|---|
| 1. | Leaf extract | 0.2g | 0.4g | 0.6g |
| 2. | Carbopol | 0.2g | 0.2g | 0.2g |
| 3. | Glycerol | 1ml | 1ml | 1ml |
| 4. | Propylene glycol | 1ml | 1ml | 1ml |
| 5. | Ethanol | 0.6ml | 0.6ml | 0.6ml |
| 6. | Triethanolamine | Q.s | Q.s | Q.s |
| 7. | Methyl paraben(5%) | 0.2ml | 0.2ml | 0.2ml |
| 8. | Distilled water | Q.s | Q.s | Q.s |

## IX. EVALUATION PARAMETERS OF ETHANOL EXTRACT OF LEAVES OF *ABUTILON INDICUM* ANTI-ACNE GEL

Table 8:

| S. No | Parameters | F (1) | F (2) | F(3) |
|---|---|---|---|---|
| 1. | Colour | green | green | green |
| 2. | Apperance | Opaque | Opaque | Opaque |
| 3. | Consistency | smooth | smooth | smooth |
| 4. | Washability | Easy to wash | Easy to wash | Easy to wash |
| 5. | $p^H$ | 6.3 | 6.0 | 5.8 |
| 6. | Spreabability | 22.8±0.4 | 21.1±0.3 | 19.6±0.2 |

## X. DISCUSSION

Network pharmacology analysis of Luteolin demonstrated its multi-target therapeutic potential in acne management. Pathway enrichment revealed significant involvement of PI3K-Akt, MAPK AND NF-κB Signalling pathways, which paly crucial roles in acne pathogenesis. These findings suggest that luteolin may reduce inflammation and oxidative damage through coordinated regulation of multiple molecular targets. Pharmacognostic study includes Physicochemical constants such as solubility, ash values, loss on drying, foaming index are mandatory for standardization of these drugs. Fluorescence analysis of leaf powder of *Abutilon indicum* is important in identification of the plant from its adulterants. In vitro antioxidant activity was carried out in ethanol extract of leaves of *Abutilon indicum.* The results of the present study showed the concentration dependent inhibition of DPPH radical. It reflects that ethanol extract of leaves of *Abutilon indicum* has free radical scavenging activity in a stoichiometric manner. Median inhibition concentration ($IC_{50}$) was further calculated. The $IC_{50}$ values of the extract indicates that it has free radical scavenging activity comparable with that of ascorbic acid. This result further substantiates ethanol extract of leaves of *Abutilon indicum* exhibited an interesting free radical scavenging activity. This property of the plant could be useful in the management acne.The present study focused on the formulation and evaluation of an herbal anti-acne gel using the ethanol extract of *Abutilon indicum*. The formulated gel exhibited satisfactory physicochemical properties such as appropriate pH, good viscosity, homogeneity and spreadability indicating its suitability for topical application. Overall, the study indicates that the herbal gel possesses promising potential as a safe, effective, and economical alternative to synthetic anti-acne preparations; however, further clinical studies and long-term stability studies are recommended to establish its therapeutic efficacy and commercial feasibility.

## XI. CONCLUSION

Antioxidant activity of the extract may scavenges free radicals produced in the acne formed area of the skin and thereby reduces inflammation and healing of the acne.This study was done to formulate and evaluate a herbal anti- acne gel made from the ethanol extract of *Abutilon indicum* leaves. The physical and chemical properties were all in the safe range, which means the raw medicine is of good quality. This investigation established rationale of using ethanol extract of leaves of *Abutilon indicum* as anti-acne agent. However, further studies are required to ensure safety, clinical efficacy of the formulation.The herbal gel had the correct pH, mixed smoothly, spread without difficulty, had the right consistency, and remained consistent over time. It didn't cause any irritation.

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## REFERENCES

[1] Anonymous, “the Indian pharmacopoeia”, Controller of Publication, Govt. of India, New Delhi, 947-948 (1966).
[2] Chase Jr, C. R., & Pratt, R. (1949). Fluorescence of powdered vegetable drugs with particular reference to development of a system of identification. Journal of the American Pharmaceutical Association, 38(6), 324-331.
[3] Lobo, V., Patil, A., Phatak, A., & Chandra, N. (2010). Free radicals, antioxidants and functional foods: Impact on human health. Pharmacognosy reviews, 4(8), 118.
[4] Mohiuddin, A. K. (2019). A comprehensive review of acne vulgaris. Journal of Clinical Research in Dermatology, 6(2), 1-34. Molyneux, P. (2004). The use of the stable free radical diphenylpicrylhydrazyl (DPPH) for estimating antioxidant activity. Songklanakarin J. sci. technol, 26(2), 211-219.
[5] Rajeshwari, S., & Sevarkodiyone, S. P. (2018). Medicinal properties of Abutilon indicum. Open J Plant Sci, 3(1), 022-025.
[6] Shende, M., & Khatri, R. (2024). Development and Evaluation of Anti-Acne Topical Gel Formulation Enriched with Herbal Extracts. Int. J. Med. Phar. Sci, 14, 1-6.