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Phytochemical evaluation and anti-psoriatic activity of the ethanolic extract of the leaves of *Momordica charantia*

L Priyanka Dwarampudi[1]*, Dhanabal SP[1]*, Sayyeda Farha[2], Ramya Gade[1], Shanmugam R[3] & Krishna Raj R[4]

[1 & 2]Department of Pharmacognosy, JSS College of Pharmacy,
JSS Academy of Higher Education & Research, Ooty-643 001, Tamil Nadu, India

[3]TIFAC CORE HD, Department of Pharmacognosy, JSS College of Pharmacy,
JSS Academy of Higher Education & Research, Ooty-643 001, Tamil Nadu, India.

[4]Department of Mechanical Engineering, College of Engineering and Technology, Dambi Dollo University, Ethiopia

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Psoriasis is a chronic, inflammatory, multi factorial disease. Topical chemical agents are used to treat psoriasis, despite their lower effectiveness or ineffective effects. Herbal medicine can be one of the alternative treatment methods. *Momordica charantia* is traditionally used to treat skin diseases, especially psoriasis. The main phytochemicals responsible for antipsoriatic activity is stigmasterol, taraxerol, lofenol, phenylpropanoids and squalene. The alcoholic soxhlation method was used to obtain the percentage phytochemical yield of 13.36% *w/w*, which was used for antipsoriatic activity using a mouse tail model of psoriasis. The extract produced significant differentiation of the epidermis as evidenced by the degree of orthokeratosis 70.18 ± 2.64% compared to the negative control 17.30 ± 4.09%. This was equivalent to the effect of the standard positive control, tazarotene gel (0.1%), which showed a degree of orthokeratosis of 90.03 ± 2.00%. The extract showed an overall antipsoriatic activity of 63.94%.

Keywords: Alcoholic soxhlation method, Ascorbic acid, *Momordica charantia*, Mouse tail model, Orthokeratosis, Psoriasis

Psoriasis is the most common skin condition affecting primarily Caucasians[1]. It is a chronic and inflammatory multifactorial disease or long-term genetically transmitted disease. About 1-3% of the world large population is affected by psoriasis. It is characterized by abnormal keratinocytes differentiation and proliferation of immune cells. It is administered by a topical treatment such as an emollient, anthralin (hydroxyantrone), which has lower efficacy and is unacceptable for cosmetic use. While modern medicines have their own side effects, *e.g.*, methotrexate causes hepatotoxicity.

Momordica charantia

Momordica charantia commonly known as "Bitter melon" or "bitter gourd"[2]. It is a member of the Cucurbitaceae family. It is used to treat various diseases such as type 2 Diabetes mellitus (T2DM), hypertension, obesity, cancer, bacterial and viral infection, chronic skin condition (psoriasis, scabies and other skin infections) and also helpful for the treatment of AIDS[3].

*Correspondence:
E-mail: lalithapriyanka25@jssuni.edu.in (LPD);
spdhanabal@rediffmail.com (DSP)

Chemical constituents of *Momordica charantia*

Momordica charantia contains an active ingredient that confers the antipsoriatic property[4]. The leaves are a good source of calcium, carotene, vitamins (riboflavin, ascorbic acid), glycoprotein (α-momorcharin, β-momorcharin), amino acids (α-alanine, β-alanine, phenylalanine, proline), steroidal glycosides (β-sito-sterol, charantine)[5]. The leaves are used in the treatment of skin diseases (such as psoriasis, wound healing, eczema, scabies, *etc.*). Chemical component responsible for antipsoriatic activity[4,5].

Stigmasterol: Controlled inflammatory features, such as decreased serum levels, promotes faster healing of the epithelial barrier, providing comfort to patients and prevention of secondary skin diseases[6].

Taraxerol: It gives the skin the property of being anti-allergic and antioxidant process[7]. Lophenol: Anti-allergic property[8]. Phenylpropanoids: Healing property[9]. Squalene: Antioxidant property that reduces the prevention of free radicals for skin damage. Provides hydration to the skin[10]. P38α MAPK plays a vital role in manypathological conditions *viz*. rheumatoid arthritis, cardiovascular disorders, cancer and psoriasis[11,12].

Momordica charantia has the ability to inhibit the enzyme guanylate cyclase, to help patients with

psoriasis. Researchers have found that the leaves and fruits are beneficial for fighting psoriasis, leprosy, scabies and healing wounds and other skin problems[13,14].

The researcher found that the dried fruit of *Momordica charantia* was used as an ointment (10% dried powder in the ointment base sample, it shows a statistically significant response (P <0.01), in terms of wound contraction capacity, closing time, epithelialization duration, regeneration of new tissue at the wound site This method is used for rat wound model, to find anti-psoriatic activity[14].

Phytochemicals of *Momordica charantia*

The main constituents in *Momordica charantia* are triterpene, proteins, steroids, alkaloid, inorganic, phenolic and lipid compounds[15] (Table 1).

Materials and Methods

Plant material: Fresh leaves of *Momordica charantia* (L.) Webb & Berth. (Cucurbitaceae) were collected in June 2009 in Sims Park, Coonoor (Nilgiris district, Tamil Nadu, India) and certified by Dr. S. Rajan, field botanist, Central Council for Homeopathy Research, Ooty (Nilgiris district, Tamil Nadu, India).

Extraction

Leaf extracted with 95% ethanol for 30 min at 70°C in Soxhlet extraction device[16-18]. Ethanol acts as a solvent. The extraction of phyto constituents must 7 days at room temperature and filtered. The semi-solid dark green color extract was obtained and percentage yield (13.36% *w/w*).

Table 1 — The results of quantitative phytochemical tests for *Momordica charantia*

S. No.	Tests	*Momordica charantia*
1	Alkaloids	Present
2	Carbohydrates	Present
3	Glycosides	Present
4	Saponins	Present
5	Triterpenes	Present
6	Fats and oil	Present
7	Resins	Present
8	Phenols	Present
9	Tannins	Present
10	Proteins and Amino acids	Present
11	Flavonoids	Absent
12	Gum and mucilage	Present
13	Steroids	Absent
14	Diterpenes	Absent
15	Monoterpenes	Absent

Phytochemical Screening Test

Preliminary phytochemical analysis of the extract was performed by simple chemical tests[19,20].

Pharmacological screening

Selected or preferred healthy adult male albino mice (25-30 g) obtained from the JSS College of Pharmacy Animal Facility (Ooty, Tamilnādu, India) were used in the study. The mice were housed in a polypropylene cage and fed a diet of standard pellets and water *ad libitum*. The room must be kept under controlled conditions (12 h light-dark cycle at 22 ± 2°C). The animals were allowed to acclimate (to new conditions) for 7 days before the experiments were performed. Permission was obtained from the Institutional Animal Ethics Committee in accordance with the CPCSEA guidelines to conduct the research on animals (registration number: JSSCP/IAEC/M.PHARM/PHYTOPHARM/04/2009-2011).

Mouse tail model

This is an *in vivo* assay determined by the study of antipsoriatic activity that is performed using a mouse tail model for psoriasis[21]. Divided into 3 groups of healthy animals were divorced. In each group of 6 animals. The first group had to contain what was not treated as a negative control, the second group is treated with standard tazarotene gel (0.1%) as a positive control. The third group was treated with the ethanolic extract of *Momordica charantia*. The extract was in semi-solid form, diluted with distilled water in the ratio of 1:2 and used for topical application for the proximal part, especially on the mouse tail. Treatment of animals was administered once a day for 14 days. About 0.5 mL *Momordica charantia* extractor tazarotene was applied to the proximal part of the mouse tail, left in contact with the skin of the tail for 2 h. After the contact of time, the tails were washed with distilled water the water. After the last 2 h of treatment, the animals were sacrificed using deep ether. anesthesia. About an inch long, the proximal part of their tail is cut off and every part of the tails are kept in different containers containing 10% formalin saline.

Histopathological evaluation

Longitudinal histological sections were prepared from the tail of mice and stained with hematoxylin - eosin. Mouse tail cells were prepared and analyzed (Fig. 1).

1) The horizontal length of the section is an individual scale stretching between adjacent hair

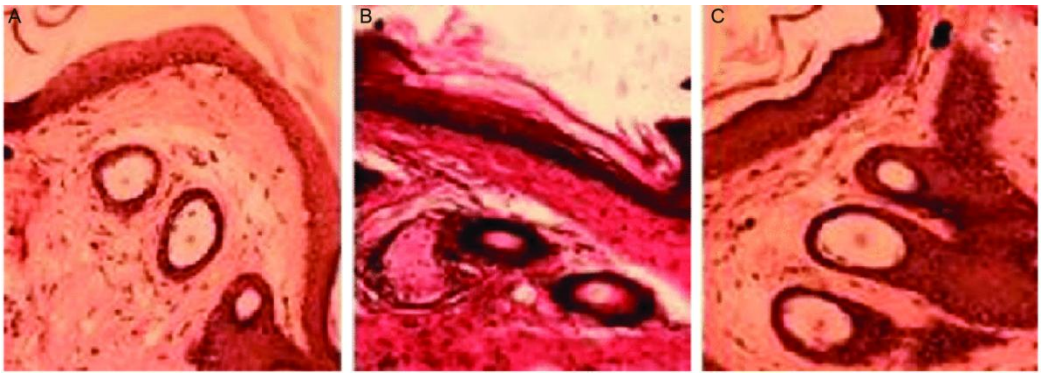

Fig. 1 — Histopathological sections of mouse tail skin treated locally for 14 days (define the original 40x microscope magnification). (A) Control; (B) 0.1% tazarotene; and (C) 95% ethanolic extract of *Momordica charantia* leaves (semi-solid form). Note that: (A) the granular layer is less developed in most parts of the control sample; (B) tazarotene-induced orthokeratosis is clearly visible over the entire horizontal length of the shell as a black layer; and (C) A well-developed granular layer is also observed in the mouse tail skin treated with the ethanolic extract of *Momordica charantia*

Table 2 — Effects of 95% ethanolic extract of *Momordica charantia* on degree of orthokeratosis and relative epidermal thickness as well as on "drug activity" in the mouse tail model

Treatment groups	Degree of orthokeratosis (%)	Drug activity (%)	Relative epidermal thickness (%)
Control	17.30±4.09*	0	100.00±10.7
Standard tazarotene 0.1%	90.03±2.00*	87.94	103.56±4.7
Momordica charantia leaves extract	70.18±2.64*	63.94	138.5±11.3

Values are mean ± standard deviation.*P<0.05 with respect to control

follicles including the sebaceous glands (n=10 scales per animal, n=6 animals per treatment group, *i.e.*, one total number of 60 measurements per treatment).

2) The horizontal length of the fully developed grain layer within an individual scale (n=10 scales per animal, n=6 animals per treatment group, *i.e.*, a total number of 60 measurements per treatment).
3) The thickness of the epidermis between the dermo-epidermal junction and the stratum corneum is the lowest part (n=5 measurements per dish, n = 10 dishes per animal, n=6 animals per treatment group, *i.e.*, a total of 300 measurements per treatment).

All things considered; the calculation is made based on the following 3 parameters used above for the evaluation of the effects of the drug (Table 2):

(a) the degree of orthokeratosis,
(b) "drug" activity and
(c) the relative epidermal thickness.

Drug Activity = OK (s) - OK (c) / 100 - OK (c)

OK (*i.e.*, orthokeratosis) like

(s) = the mean of the parameter explained below for a test substance and

(c) = the untreated control condition, respectively.

Statistical analysis

In the mouse tail test method for statistical comparisons and exploratory probabilities were obtained with the Mann Whitney-U test method. Statistical calculations were performed using Graph Pad Prism software. Values with P <0.05 are considered significant.

Results

The phytochemical yield of the leaf extract of *Momordica charantia* (semi-solid form) was found at 13.36% *w/w*. The main constituents rejoice in the presence of triterpene, proteins, steroids, alkaloids, inorganic, phenolic and lipid compounds are found in *Momordica charantia*.

Extraction of the leaves of *Momordica charantia* produced significant differentiation in epidermis as evidenced by the degree of orthokeratosis (70.18 ± 1.92 ***) compared to control (17.30 ± 4.09%). It corresponds to the standard tazarotene gel (0.1%) which has shown (90.03 ± 2.00%) degrees of orthokeratosis. Generally, *Momordica charantia* extract was found *i.e*, 63.94% activity in the mouse tail model method is used for the treatment of psoriasis. *Momordica charantia* leaf extract also had significant effects on the epidermis thickness, increase over the control group.

Discussion

Psoriasis due to the lack of actual pathophysiology remained as untreatable disease[22]. Ascorbic Acid (Vitamin C) acts as an antioxidant to protect cellular components of free radical damage, effective against

psoriasis and other skin conditions[23]. HPTLC the fingerprint technique is used for the estimation of ascorbic acid in *Momordica charantia* leaf extract[2]. *Momordica charantia* has revealed the presence of ascorbic acid, which may be correlated with antipsoriatic activity[16]. The absence or reduction of the granular layer of the epidermis in psoriatic lesions is known as a parakeratotic state, one of the main features of psoriasis[14]. The principle behind the mouse tail test is the conversion from parakeratos is to orthokeratosis[15]. This parakeratotic state is observed in the tail of normal adult mice. Induction of orthokeratosis in the proximal part of the adult mouse tail is used for the mouse tail modelwhere the formation of a granular layer is indicated by the degree of orthokeratosis[20]. *Momordica charantia* leaves provided to be safe, tolerable, effective, and beneficial in treating. psoriasis. In addition, compounds such as momorcharins are said to contain guanylate a property of inhibiting the enzyme cyclase that would be useful in the treatment of psoriasis.

Conclusion

Our study can provide strong evidence of the anti-psoriatic property present in *Momordica charantia*. Psoriasis is the most common skin condition or multifactorial condition. Herbal medicines are safe, tolerable, and effective have fewer side effects than synthetic drugs. The 95% ethanolic extract of *Momordica charantia* leaves (semi-solid) was used to topical and beneficial application for the treatment of psoriasis.

Conflict of interest

All authors declare no conflict of interest.

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