

## Cream Containing *Acacia* Bark Extract Significantly Reduces Skin Sebum Content in Healthy Volunteers

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This study presents sebum reduction in volunteers' cheeks when applied a cream containing *Acacia* bark extract analyzed by non-invasive instrument Sebumeter. A cream containing *Acacia nilotica* bark extract (3%) versus base was applied in single blinded study twice daily to the cheeks for a period of 12 weeks. The instrumental measurements were carried out with Sebumeter under a draught-free room, with controlled temperature (18.0–20.6°C) and relative humidity (55–65%). Active cream showed a significant decrease in skin sebum and base showed insignificant results when applied ANOVA. This study indicates that incorporation of *Acacia* bark extract in creams significantly reduces sebum secretion *in vivo* and can be used for the topical treatment of oily skin in humans.

**Keywords:** Cream; Sebum; *Acacia nilotica*; Sebumeter.

### Introduction

According to diverse findings, 66% to 75% of the population aged between 15 and 20 years bear from an increased sebum production, leading to decreased self-confidence and a weakening of individual quality of life<sup>1</sup>. Sebaceous glands are microscopic, multiacinar, holocrine-secreting tissues existing on skin excluding palms and soles lobular glandular structures within the pilosebaceous units of the skin. Sebum is produced by sebaceous glands<sup>2</sup>. Sebum is a complicated mixture of lipids embracing triglycerides, cholesterol esters, wax esters, squalene, and free fatty acids. Under physiological conditions, sebaceous lipids work for the integrity of the skin, affect inflammatory processes, transport antioxidants to the skin surface, and have innate antimicrobial activity<sup>3</sup>. Augmented sebum fabrication is also connected with an undesired decorative appearance, normally denominated greasy skin, oily skin, or amalgamation skin. Out of these reasons seek is concentrating towards sebum reducing plants and their constituents. In recent years, phenolics have gained considerable attention due to their use in skin care; such as acne, dryness, eczema, free-radical scavenging, anti-inflammatory, anti-aging and skin protection effects<sup>4</sup>. Recently, topical formulations have gained considerable

interest as a vehicle for the drug delivery to the human skin<sup>5</sup>. A figure presented skin diseases are thought to be connected with oxidative stress, including psoriasis, acne and cutaneous vasculitis<sup>6</sup>. This study presents the efficacy of a cream containing *Acacia* bark extract on sebum secretion *in vivo*.

*Acacia nilotica* (Mimosaceae) is a remedial plant recognized to be fruitful in phenolics, consisting of condensed tannin and gallic acid, phlobatannin, pyrocatechol, (+) -catechin, protocatechuic acid, (-) epi-gallocatechin-7-gallate and (-) epigallocatechin-5, 7-digallate. Different parts of this plant such as the roots, seeds, leaves, bark, flowers, fruits, gum and immature pods act as antimutagenic, anti-cancer, vasoconstrictor, spasmogenic, anti-asthmatic, cytotoxic, anti-pyretic, anti-diabetic, anti-plasmodial, molluscicidal, anti-platelet aggregatory, anti-fungal, inhibitory activity against Hepatitis C virus (HCV) and human immunodeficiency virus (HIV)-I<sup>7</sup>.

This study presents the sebum reduction profile of *Acacia nilotica* bark extract incorporated in creams and sebum reduction profile by active cream was compared with base.

### Materials and methods

#### Plant Material

*Acacia nilotica* bark was assembled during July 2010 in Dera Ghazi Khan, Pakistan and air dried at room

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temperature for a period of 4 weeks. *Acacia nilotica* bark was collected and identified by Cholistan Institute of Desert studies and specimen (Voucher No. AN-BK-01-01-10-030) was deposited by Herbarium, The Islamia University of Bahawalpur.

### Preparation of the Formulation

An active cream was formulated by an anionic hydrophilic colloid (14% Paraffin oil), 2% Abil EM 90, 3% *Acacia nilotica* bark aqueous ethanolic extract, 1% fragrance and rest of deionized water. Heated oily phase and aqueous phase were mixed using homogenizer (Euro-Star, IKAD 230, Germany) by adding extract and fragrance. Base was formulated without extract using previously described method.

### Subjects

Eleven subjects were preferred with an age between 20 to 35 years. All subjects were healthy males with no identified dermatological diseases or allergy to ingredient in active creams. This study was followed by Declaration of Helsinki. Informed consent was signed before beginning of this investigation from all subjects. The omission reasons were as follows presence of, any dermatitis and/or other skin or allergic diseases, smokers and previous treatment of forearms' skin with cosmetic active creams such as sunscreens, moisturizers or anti-ageing cosmetics. During the investigation, the volunteers were allowed to rinse generally, but were coached not to aid any other skin care products on their arms. The volunteers were asked not to apply any topical products on cheeks 24 hours before the beginning and throughout the test period. Furthermore, solar experience and practice of occlusive clothes on the trial area were forbidden.

### Instrumental Assessment

Non-invasive measurements were also executed. All measurements were completed in a draught-free room, with controlled temperature (18.0–20.6 °C) and relative humidity (50–65%). The sebum levels of both cheeks were determined with a photometric device Sebumeter MPA 5 (Courage + Khazaka, Germany). Sebum was collected with special opaque plastic tape (64 mm<sup>2</sup>) by pressing onto the skin for 30 s with a slight pressure. The resulting increase in transparency of the tape was measured and the displayed values tally to the sebum amount on the skin surface in µg sebum/cm<sup>2</sup>.

### Study Protocol

*In vivo* studies have been conducted during the winter months (December to March). Instrumental measurements were done by the author according to manufacturer's guidelines. Two weeks before study begin and during the treatment period, the volunteers were permitted only the use of regular cleansing products. Before the begin working, the patch test was performed on the forearms of all volunteers for 48 hours to identify any itch, irritation or redness on the skin when applied tested creams. Each volunteer was then given two creams, active cream having the extract of the plant and a base without the extract. The volunteers were coached about the appropriate use of the creams. Measurements of skin sebum level were completed every second week up to end study period three months. Before the skin measurements were made, the volunteers remained in a sitting position for 15 min to acclimatize to external conditions. Approximately 500 mg of both base and active cream were instructed to apply to the cheeks twice daily (mornings, 7:00–9:00; evenings, 19:00–21:00) over a 12 weeks period at home by the volunteers. The area around the eyes was omitted.

### Statistical Analysis

The sebum values of the right and left cheek of the volunteers were calculated at zero hour, 2<sup>nd</sup> week, 4<sup>th</sup> week, 6<sup>th</sup> week, 8<sup>th</sup> week, 10<sup>th</sup> week and 12<sup>th</sup> week. The data achieved was then analyzed by the SPSS 17.0 on the computer by using the two-way ANOVA for variation between different time intervals and the paired sample t-test for the variation between the two products. The level of significance was 5 %.

### Ethical standards

The approval of this study (Ref. No. 3715/Acad) was taken from the Board of the Advanced Study and Research (BASAR), the Islamia University, Bahawalpur and the Institutional Ethical Committee, Faculty of Pharmacy and Alternative medicine, The Islamia University, Bahawalpur.

### Results and discussion

In this present investigation, both base and active cream were assessed for skin sebum level (Figure 1). Sebum measurements were carried out for 12 weeks. It was found from our results the base has a variable tendency on skin sebum but in active cream, it was found that sebum contents regularly was decreased throughout the investigation.

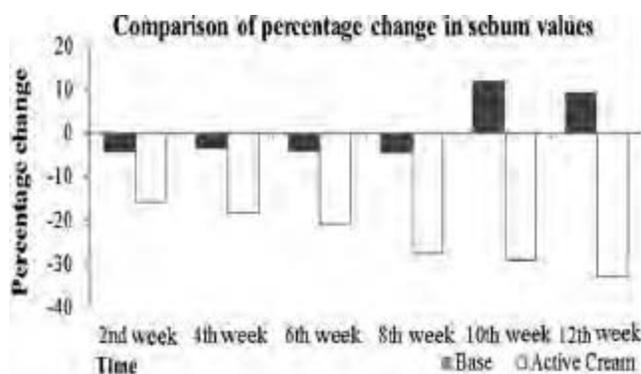


Fig. 1—Percentage of change in the sebum values of volunteers after the application of Base and Active cream

After applied ANOVA test, it was found that there was an insignificant effect of base with respect to time while in case of active cream it was evident that sebum content was significantly reduced with respect to time.

When the paired sample t-test was applied it was found that the base and active cream showed significant results regarding the skin sebum content with respect to time. It is reported that sebum secreted by sebaceous glands is coordinated by estrogens and androgens (sex hormones), corticosteroids (hormones of the adrenal cortex) and others. Androgens receptors and 5 $\alpha$ -reductase are responsible for conversion of testosterone into dihydrotestosterone (the most active form stimulating sebum secretion). It has been reported that androgens receptors are present in various parts of skin areas. Various reasons behind to increase the sebum secretion are: (1) dihydrotestosterone DHT is a testosterone metabolite synthesized with the use of 5- $\alpha$ -reductase type I (2) progesterone is an inhibitor of 5 $\alpha$ -reductase. This hormone increases seborrhea by stimulating the division of sebocytes<sup>3,8</sup>.

Phenolic compounds have the potential to inhibit the 5  $\alpha$ -reductase. Epigallocatechin gallate, myrecetin, quercetin, rutin, morin, toxifolin, chrysin, baicalein, fisetin, biochanin A, genistein, kempferol, emodin anthraquinone, caffeic acid phenethyl ester and octyl and dodcyl gallates are examples of phenolic compounds which have inhibitory activity against 5- $\alpha$ -reductase<sup>10,11</sup>. It is assumed that continuous reduction of sebum by application of active cream in human cheeks in our results reported was due to presence of phenolic compounds in *Acacia* bark extract in active cream. The bark has been reported prosperous in phenolics viz. condensed tannin and phlobatannin, gallic acid, protocatechuic acid pyrocatechol, (+) - catechin, (-) epigallocatechin-7-gallate,

and (-) epigallocatechin-5,7- digallate. The bark is also reported to contain (-) epicatechin, (+) dicatechin, quercetin, gallic acid, (+) leucocyanidin gallate, sucrose and (+) catechin- 5-gallate t:7. Epigallocatechin gallate were same reported found in green tea to reduce sebum content<sup>12</sup>. Total phenolic contents reported in *Acacia* bark extract are  $16.5 \pm 0.66$  (GAE g/100 g of DW)<sup>13</sup>. Inhibitory activity of 5- $\alpha$ -reductase of these compounds lead to reduced sebum content when applied topically.

## Conclusion

In conclusion, cream containing *Acacia* bark extract reduces sebum secretion *in vivo*. Treatment with a cosmetic formulation containing 3% *Acacia* bark extract resulted in a significant sebum reduction. Out of these reasons, *Acacia* bark extract can be regarded as an effective cosmetic ingredient for use in face care formulations to reduce the skin oiliness in a natural way. However, it is suggested that topical applied *Acacia* bark extract may speculate the results against acne vulgaris, acne rosocca, acne infantum, acne tarda and others.

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