HAIR GROWTH PROMOTING ACTIVITY OF BENINCASA HISPIDA ON ANDROGEN INDUCED ALOPECIA ANIMAL MODELS

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ABSTRACT

India is a country known for ancient scripts, the number therapeutical system, invention of zero and vedas. Use of plants as a source of medicine has been an ancient practice and is an important component of the health care system in India. Hair loss or baldness (technically known as alopecia) is a loss of hair from the head or body. Evaluating and treating hair loss (alopecia) is an important part of primary care, yet many physicians find it complex and confusing. Hair loss affects men and women of all ages and frequently has significant social and psychologic consequences. The aim of the study was to prepare different extract of the selected plant Benincasa hispida, Chemical test of extract to confirm chemical constituents and to study the pharmacological activity of the plant extract on androgen induced alopecia animal models.

KEYWORDS: Alopecia, Androgen, CMC, Minoxidil.

INTRODUCTION

Male pattern baldness or Androgenetic alopecia (AGA) term consists of two terms Androgen (Andro) and genes (genetic). It runs in families. It is inherited condition associated with a gene or genes. Both the testosterone metabolite Dihydroxy Testosterone one and the genes for hair loss must be present for AGA to occur. The hair loss is heritable, androgen-dependent, and occurs in a defined pattern. It is assumed that the genetically predisposed hair follicles are the target for androgen-stimulated hair follicle miniaturization, leading to gradual replacement of large, pigmented hairs (terminal hairs) by barely visible, depigmented hairs (vellus hairs) in affected areas. Treatment of androgenetic alopecia has been one of the
major concerns for cosmetologists, and dermatologists. Over the centuries, a wide range of remedies have been suggested for androgenetic alopecia and currently treatments include wigs and hairpieces, surgery, hormone action modifiers, and non-hormonal therapy. Pharmacological therapies are based on understanding of the mechanism of action of androgen in hair follicle. Use of natural products has been quiet common in hair care industry and the search for natural products is being continuously promoted.

*Benincasa hispida* (Synonym: *Benincasa cerifera*)[^4], which commonly called (winter melon, ash gourd, white pumpkin and wax gourd, white gourd, tallow gourd, gourd melon and Chinese watermelon) belongs to the cucurbitaceae family, it was probably native in Japan and Java, cultivated more or less throughout India and in warm countries. It is a popular vegetable crop, especially among Asian communities both for nutritional and medicinal purposes[^5, 6]. It was preferred as a cooked vegetable, boiled alone, boiled with meat, or included in a variety of dishes. Also, it was used as raw like sliced cucumbers[^7]. However, the plant was used medicinally in various complains such as gastrointestinal problems, respiratory disease, heart diseases, diabetes mellitus and urinary diseases[^8]. Fruits were traditionally used as a laxative, diuretic, tonic, aphrodisiac, cardiotonic, urinary calculi, blood disease, insanity, epilepsy, schizophrenia and other psychologic disorders, jaundice, dyspepsia, fever, and menstrual disorders[^9, 10]. The present investigation is to prepare the alcoholic as well as the aqueous extract of the fruit of plant *Benincasa hispida* an attempt to show its efficacy in testosterone-induced hair loss and Chemical test of extract to confirm chemical constituents.

**MATERIALS AND METHODS**

**Plant Materials**

The fruits of the plant *Benincasa hispida* were collected from local regions of Virudhunagar district. The identity of the plant was confirmed at the Department of Botany, Ayyanadadar Janaki ammal colleges of arts and sciences, Sivakasi, India.

**Preparation of Alcoholic and Aqueous Extract**

Extraction involves the separation of bioactive portion of the plant tissues from the inactive components by using selective solvents in standard extraction procedure. About 1 kg of the air dried plant material was extracted successively with solvents of increasing polarity using soxhlet extractor. The fruit was cut into small pieces and dried under shade for a period of 3-4 days till the water content was completely removed. Then the dried pieces of the plant were
finely powdered. Then the entire powdered mass was weighed. After which the powder was extracted using a soxhlet’s apparatus using methanol and water separately. This process was done for a period of 48 hours. The extract was then taken and it was concentrated.

**Preliminary Phytochemical Analysis**

The successive extract, as mentioned above, were subjected to various qualitative phytochemical test for the identification of chemical constituents present in the plant material.\(^{11,12}\)

**In vivo Studies on Hair Growth**

**Animal and Animal feed**

Rats were maintained in clean, sterile, polypropylene cages and fed with commercial pellet (M/S Hindustan lever ltd, Bangalore, India) and water ad libitum. The study was approved by the institutional ethical committee, which follows the guidelines of committee for the purpose of control and supervision of experimental animals (CPCSEA 509/02/C/CPCSEA/2002). The rats were procured from Madurai. They were allowed to get accustomed to the climatic conditions for two weeks.

**Preliminary Skin Irritation Test**

The alcoholic as well as the aqueous extract of the fruit of plant *Benincasa hispida* was applied in a concentration of up to 10% for seven days on shaved skin surface of wistar rats which did not show any irritation or erythema on skin surface. Thus the prepared extracts were considered safe for topical administration.\(^{13}\)

**Testosterone Test Solution**

To induce alopecia testosterone was administered. For this purpose the rat were sub-divided into 4 groups each consisting of 6 rat each. 5mg of steroid suspended in a total volume of 1ml of the vehicle (Carboxy Methyl Cellulose), injection were given once per day for 5 days a week excluding weekend for a period of 12 weeks.\(^{14}\)

**Treatment of Animal for Study**

After producing alopecia in animals, all the 24 animals were divided into four groups of six animals in each group. The groups of animals selected for the pharmacological evaluation were as follows:

- **Group I**: Animals were given topical application of the cream base and served as control.
- **Group II**: Animals were treated with 1ml of 2% minoxidil and served as positive control.
Group III: Animals were given topical application of alcoholic extract of the fruit of plant *Benincasa hispida*.

Group IV: Animals were given topical application of aqueous extract of the fruit of plant *Benincasa hispida*.

This process was repeated continuously for a period of 40 days. The application of the drug and the extracts was done only once a day. Finally on 41\textsuperscript{th} day of the study blood samples skin was collected from depilate area for physical parameters.

**Physical Parameters**

1. **Hair Length**

Hair was plucked randomly from the depilated area with the help of electric clipper and measured the hair length with the help vernier caliper and calculated the mean of hair length.

2. **Hair Density**

A hole of 1 cm\textsuperscript{2} was made on card board. Then the card board was set on the desired depilated area (where hair fall patches observed) on the back of rat after 41 days of depilation. The hair was trimmed of desired depilated area, the hair was cut with the scissors and counted manually.

**RESULT AND DISCUSSION**

**Phytochemical Screening**

The alcoholic extract of the fruit of plant *Benincasa hispida* shows the presence of Glycosides, phenolics, flavonoids, Saponins, carbohydrates and volatile oil. Aqueous extract of the fruit of plant *Benincasa hispida* shows the presence of glycosides, phenolics, flavonoids, carbohydrates and volatile oil. (Table no 1).

**Tab.No 1 Phytochemical Analysis for the Presence of Active Constituents Present in Plants Fruit Extract**

<table>
<thead>
<tr>
<th>S, No</th>
<th>Active Constituents</th>
<th>Alcoholic Extract</th>
<th>Aqueous Extract</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carbohydrate</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>Saponins</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Phenolic compounds</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>4</td>
<td>Glycosides</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>5</td>
<td>Volatile oil</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

+ Present - Absent
Hair Growth Effect

The animals were administered testosterone to induce alopecia loss of hair from the dorsal region of rat was clearly visible (Fig no 1). The animals of group 1 (control group) showed diffuse alopecia. Loss of hair from dorsal portion of rat was clearly visible after 41 days treatment with testosterone. The observation was better in animals of group IV (aqueous extract) no signs of alopecia were developed. In animals of group III the alopecic conditions was not visible and showing that the alcoholic extract successfully prevented testosterone induced hair loss. (Fig no 2). The animals were administered testosterone to induce alopecia loss of hair from the dorsal region of rat was clearly visible (Fig no 1). To the animals of group III the extract was administered shows clearly the alopeciac condition was not visible in this group of animals (Fig. No-2). The observation was the same in animals of group IV which received aqueous extract (Fig. No-2)

Fig No 1: The Animal Shows Hair Loss From Dorsal Region And Hair Become Thin, i.e. Alopecia Condition Is Visible In Animal Due To Testosterone Administration.

Fig 2. The Dorsal Skin of Standard And Extract Treated Animal Does Not Develop Alopecia.
There is a significant increase in the percentage of hair follicle, hair length and hair count in alcoholic, aqueous extract as compared to control groups as shown in Tab 2,3. It is clear that aqueous extract shows better hair growth promoting activity than alcoholic extract.

Table No 2: Effect of Different Extract Formulation on Hair Length of Albino Rats in Animal Model Study

<table>
<thead>
<tr>
<th>Group</th>
<th>Formulations</th>
<th>Hair growth in mm (Mean±s.d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>Control ointment base</td>
<td>2.4±0.25</td>
</tr>
<tr>
<td>Group II</td>
<td>2% Minoxidil</td>
<td>7.02±0.34</td>
</tr>
<tr>
<td>Group III</td>
<td>Alcoholic extract</td>
<td>5.82±0.20</td>
</tr>
<tr>
<td>Group IV</td>
<td>Aqueous extract</td>
<td>4.31±0.86</td>
</tr>
</tbody>
</table>

Table No 3: Effect of Different Formulations on Hair Density of Albino Rats In Hair Growth Activity

<table>
<thead>
<tr>
<th>Group</th>
<th>Formulations</th>
<th>Hair count per cm² area (Mean±s.d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>Control ointment base</td>
<td>560±32.46</td>
</tr>
<tr>
<td>Group II</td>
<td>2% Minoxidil</td>
<td>2541±23.45</td>
</tr>
<tr>
<td>Group III</td>
<td>Alcoholic extract</td>
<td>1822±34.65</td>
</tr>
<tr>
<td>Group IV</td>
<td>Aqueous extract</td>
<td>1422±42.34</td>
</tr>
</tbody>
</table>

CONCLUSION

In the present study the fruits of *Benincasa hispida* were selected to explore the scientific information on phytochemical and pharmacological aspects. The parameter which are reported under botanical description and evaluate the phytochemical studies of plant Benincasa hispida showed the presence of active constituents in the various extract. Some of the active constituents present in the alcoholic and aqueous extract are as follows alkaloids, Carbohydrates, Saponins, Phenolic compounds, Steroidal compounds Resins and flavanoids and from the experiments done above it can be concluded that the fruits of *Benincasa hispida* promote hair growth activity. The reason for which may be any of the above mentioned constituents.

REFERENCE


