Role of Cyperus rotundus oil in decreasing hair growth

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Abstract

Background: There is a lack of value of Egyptian Cyperus rotundus essential oil in the treatment of Androgenic hair. Aim: To evaluate the efficacy and safety of application of Egyptian Cyperus rotundus essential oil in comparison to 0.9% saline on androgenic hair.

Methods: Ninety one female patients with Androgenic hair (hirsutism and axillary hair) completed the study. They were randomly assigned to two groups: group I (active group) (n=47) and group II (control group) (n=44). Patients used topical Cyperus rotundus essential oil for six months and were evaluated on the 6th month.

Results: The topical Cyperus rotundus oil was significantly more effective (p<0.05) than the placebo without side effects. This result was proven by three assessment methods; difference in hair count, independent observer assessment and patients’ self assessment.

Conclusion: The topical Egyptian Cyperus rotundus essential oil is an effective method in treating moderate degrees of hirsutism and axillary hair. But without affecting serum testosterone. This study is the first report on using Cyperus rotundus essential oil for decreasing hair growth

INTRODUCTION

Growth of sexual hair (androgenic hair) is entirely dependent on the presence of androgen [1-5]. Before puberty, hair in androgen-sensitive follicles is vellus (small, straight, and fair). In response to the increased levels of androgens at puberty, vellus follicles in specific areas develop into terminal hairs (larger, curlier, and darker, hence more visible), becoming sexual-hair follicles; higher androgen levels are required for the growth of a beard than for the growth of pubic and axillary hair [1-5].

Hirsutism results from an interaction between the androgen level and the sensitivity of the hair follicle to androgen. Severity of hirsutism does not correlate well with the level of androgen, because the response of the androgen-dependent follicle to androgen excess varies considerably within and among persons. Some women with excess androgen have no skin manifestations, or they may have seborrhea, acne, or androgenic alopecia without hirsutism [6]. It is a distressing condition for a lot of women, and leads to significant psychological distress that supports a multibillion-dollar effort to reverse this condition [7].

The available allopathic medicines for treating this condition are electro-epilation, LASER (Light Amplification by the Stimulated Emission of Radiation) for hair removal, Intense Pulsed Light, Eflornithine, oral anti-androgens, oral contraceptives and finasteride [8,9]. Nowadays, the new approaches have been tried to develop the herbal formulations for curing this condition and to avoid harmful side effects of the allopathic system. Egypt is famous for the herbal medicine since ancient times [10]. It is still a confident way of remedy among Bedouins and folk communities. Although in traditional systems of medicine, there are reports of many plants and herbal formulations for decreasing hair growth, the lack of sound scientific backing and information limits their use [11, 12].

Egyptian Cyperus rotundus (Cyperaceae) is a well-known functional food and traditional herbal medicine.
From the plant profile of C. rotundus, it possess: antioxidant and anti-apoptotic activities [13], hypoglycemic activity [14], protein oxidation protection [15, 16], 5α-reductase inhibitor [17], antibacterial and anti-fungal as biological activity [18-21], anti-platelet effects [22] and anti-inflammatory activity [23]. Also, patients with irritable bowel syndrome benefit from two weeks treatment by receiving a capsule containing powder of a crude plant with [24].

Phytochemical studies have shown that the major chemical components of this herb are essential oils, flavonoids, terpenoids, mono-and sesquiterpenes [25-26]. The plant contains the following chemical constituents-Cyproten (1), cypera-2, 4-diene (2), a-copaene (3), cyperene (4), aselinen (5), rotundene (6), valencene (7), ylanga-2, 4- diene (8), g-gurjunene (9), trans-calamenene (10), d-cadinene (11), g-calacorene (12), epi-a-selinene (13), a-muurolene (14), g-muurolene (15), cadalene (16), nootkatene (17) by comparison with a spectral library established under identical experimental conditions [27], cyperotundene (18) [28], mustakone (19), cyperol (20) [29], isocyperol (21) [30] and a-cyperene (22) [31-32].

In this study, we have evaluated the effect of topical application of Cyperus rotundus essential oil on hairy skin.

MATERIALS AND METHODS

Plant Materials

Tubers of Egyptian C. rotundus were taken from the National Research Centre Farm of Aromatic and Medicinal Plants.

Preparation of the Essential oil:

The oils were prepared by hydrodistillation of the underground parts (tubers) of C. rotundus. The prepared oils were kept refrigerated until usage. Percentage yield was determined according to the Egyptian Pharmacopoeia [33].

Patients

This single blinded, placebo-controlled study was carried out on 91 patients who had moderate degree of hirsutism & axillae (androgen dependent areas) and were between the ages of 19 to 63 years. Active group contained of 20 axillae and 27 hirsute [stage 3 (2cases), stage 2(18 cases), stage 1(7 cases) Ferriman – Galloway]. Volunteers and patients were recruited from the outpatient clinic of the dermatology department, in University Hospital of Suez Canal University, at the period from July 2011 to February 2012. The study was carried out in accordance with the guidelines of the Helsinki Declaration, and was performed after obtaining the informed consent from all patients.

Patients participate in this study were randomly distributed to 2 groups:

1- Group (I) active group: contained of 47 patients who treated with oil applied on the tested area twice daily.

2- Group (II) placebo group: contained of 44 patients who treated with a 0.9% saline applied also twice daily.

The inclusion criteria were as follow:

A- Normal volunteers who are seeking removal of axillary hair.

B- Patients with hirsutism who:

1. Matched with the diagnostic criteria of hirsutism according to the 2006 guidelines of the Alberta Medical Association.

2. Had no other dermatological disease.

3. Had no other systemic disease.

Patients like breast feeding women, pregnant women or patients already receiving treatment for decreasing hair growth were excluded from the study.

Full history was taken from each patient in addition to a general and systemic examination. Serum testosterone and ovarian ultrasound were done to all hirsute patients. Ferriman-Galloway Score applied to all hirsute patients. Patients were asked to remove hair their usual way (sugaring and threading) every 3 weeks. After each session of hair removing, patient put ¼ ml of the oil/saline on the tested area and rubbed for 2 minutes until absorption. Then they put ¼ ml of oil/saline twice daily after washing and cleansed the test area till the end of study. Oil/saline was given to patients in similar containers without any labels.

Assessment:

After 1 month of the last hair removing session, three methods were used to assess the results: hair count in a defined area of the skin, independent observer assessment of global photo-graphs and patients’ self assessment. At each visit (every week) digital photos were taken for the tested area at standard distance and light conditions. At the tested area, counting (for white and black hair) was done in the beginning of the 1st month and the 6th month with the help of a hand magnified lens (x10) in a circle 1cm diameter.

Reproducibility of this area was assured by using a cardboard target area template, which had multiple holes, each of 1 cm diameters. The first hole was 2 cm away from the beginning of the strip, and the rest of the holes were 1cm apart from each other. The beginning of the strip was centralized at the sternal notch, then run horizontal with the arm abducted in 90° to meet the
axilla at midline. For the chin, the strip ran from the mandibular angle along with the arch to the chin. Every patient had his marked and fixed hole, which was determined at the 1st visit.

Three professional independent observers examined the photos which had been taken at the 1st month and the 6th month. The mean value of all three assessment methods was taken. Assessment of improvement was done using a score from -1 minimal (< 20%), 2 = mild (20% - 39%), 3 = moderate (40% - 59%), 4 = good (60% - 79%) and 5 = excellent (80% - 100%).

At the 6th month the patients were asked to fill a self-assessment questionnaire to evaluate the regression degree of area covering and hair quality (rate of hair growth, hair thickness, its color and brightness). The results of the patients’ opinions for the area covered were scored as follows: -1 = worse, 0 = no change, 1 = mild <25%, 2 = moderate (25% -49%), 3 = good (50% -74%) and 4 = excellent (>75%) improvement. As for hair quality, each parameter was given a score of -1 = worse compared to the base line, 0 = no change, +1 = improved.

At each visit the patients were asked about local side effects (irritation, dis-pigmentation, and folliculitis). They also were asked about the smell, color and greasiness of oil.

Statistical analysis of data was done using SPSS (statistical program for social science) version 12. Receiver operating characteristic (ROC) curve was used to determine a cutoff value for a clinical test.

RESULTS:

Demography: 91 out of 100 females with unwanted hair, completed the study (group I, n=47) and group II (n=44). Two cases in the active group and six cases in the control group were lost to follow up. Also, one case discontinued the study as she could not tolerate the smell of oil. The mean age of all included cases was 35.96 ± 1.15 years (range 19-63 years) (graph 1). The studied group contained 20 axillae and 27 hirsutes [stages 2 (1case), stage1 (3 cases) Ferriman – Gallwey and rest cured]. There was no significant difference before and after treatment in serum testosterone level and ultrasonic picture of ovaries between the two groups (table 1).

Hair Count Assessment: The mean of baseline hair count in a circle of 1 cm diameter on the skin of active treated group was 23.3 ± 10.9 (table 2). There was no significant difference between the two groups with respect to age and site. Hair Count Assessment: At month 6 of the study, mean hair count in the (group II) increased by 24.7 ± 6.2 hairs, while hair counts in the (group I) decreased by 1.7 ± 2.1 hairs, the difference was statistically significant (p < 0.001) (graph 2).

Independent observer evaluation of global photographs: 32 (68.1 %) cases out of 47, 14 cases (29.8%), 1 case (2.1%) in the active group have excellent, good and moderate improving respectively, and 24 (54.5%) out of 44 and 20 (45.5%) in the placebo group were reported as no change and worse respectively. The active group showed significantly greater improvement than the placebo group (p<0.05) (table 3).

Patients’ self-assessment: Regarding the decrease of hair density or skin covering which was assessed by the patients, the active group showed significantly greater improvement than the placebo group (p<0.05). The patients who considered their decrease in hair growth obvious (decrease more than 50%) were 97.9% and 0% in group I and II respectively (table 4).

Change of hair quality: A significant decrease in the rate of hair growth (p=0.001) and increase in hair growth was noticed by the patients in the active and placebo group respectively. The active group reported a significant decrease of hair thickness (p=0.001), color, and brightness (p=0.001) compared to the placebo group (table 5).

Only 24 patients in the control group and 20 patients in the active treated group had white hair. All cases in later groups show a significant decrease in white hair count, quality and density (p=0.001) (table 2).

ROC curve analysis shows that hair count before treatment ≤ 21 can be used as predictor for complete cure after continuing treatment for 6 months (graph 3).

The observer assessment and patients’ self assessment were concordant.

Safety & tolerability:

C. rotundus oil was used previously as oral and topical therapy in animals and humans without any side effects [13-24]. The only side effects which noted during the study was the smell. No cases were reported to have infection, folliculitis, dis-pigmentation, itching or irritation.
Fig. 1. a) Group I before and b) 6 months after start of treatment.

Fig. 2. a) Group I before and b) 6 months after start of treatment.

Fig. 3. a) Group II before and b) 6 months after start of treatment.
Graph 1. Mean age among both groups

Graph 2. Hair count before and after treatment in both groups

Table 1. Demographic data of hirsute in two groups

<table>
<thead>
<tr>
<th></th>
<th>Study (n=27)</th>
<th>Control (n=27)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before</td>
<td>After</td>
</tr>
<tr>
<td></td>
<td>treatment</td>
<td>treatment</td>
</tr>
<tr>
<td></td>
<td>Before</td>
<td>After</td>
</tr>
<tr>
<td></td>
<td>treatment</td>
<td>treatment</td>
</tr>
<tr>
<td>Hirsutism</td>
<td>Ferriman – Gallwey score</td>
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</tr>
<tr>
<td>Stage 0</td>
<td>0 (0%)</td>
<td>23 (85.1%)</td>
</tr>
<tr>
<td></td>
<td>0 (0%)</td>
<td>8 (29.6%)</td>
</tr>
<tr>
<td>Stage 1</td>
<td>7 (26%)</td>
<td>3 (11.1%)</td>
</tr>
<tr>
<td></td>
<td>8 (29.6%)</td>
<td>8 (29.6%)</td>
</tr>
<tr>
<td>Stage 2</td>
<td>18 (66.6%)</td>
<td>1 (3.8%)</td>
</tr>
<tr>
<td></td>
<td>18 (66.6%)</td>
<td>18 (66.6%)</td>
</tr>
<tr>
<td>Stage 3</td>
<td>2 (7.4%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td></td>
<td>1 (3.8%)</td>
<td>1 (3.8%)</td>
</tr>
<tr>
<td>Testosterone</td>
<td>Normal</td>
<td>22 (81.5%)</td>
</tr>
<tr>
<td></td>
<td>24 (88.9%)</td>
<td>24 (88.9%)</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>5 (18.5%)</td>
</tr>
<tr>
<td></td>
<td>3 (11.1%)</td>
<td>3 (11.1%)</td>
</tr>
<tr>
<td>Overian u/s</td>
<td>Normal</td>
<td>16 (59.2%)</td>
</tr>
<tr>
<td></td>
<td>18 (66.6%)</td>
<td>18 (66.6%)</td>
</tr>
<tr>
<td></td>
<td>Mild</td>
<td>10 (37%)</td>
</tr>
<tr>
<td></td>
<td>9 (33.4%)</td>
<td>9 (33.4%)</td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
<td>1 (3.8%)</td>
</tr>
<tr>
<td></td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td></td>
<td>Severe</td>
<td>0 (0%)</td>
</tr>
<tr>
<td></td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
</tbody>
</table>

Table 2. Hair count and white hair count in two groups

<table>
<thead>
<tr>
<th></th>
<th>Control (n=44)</th>
<th>Study (n=47)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before treatment</td>
<td>After treatment</td>
<td>Before treatment</td>
</tr>
<tr>
<td>Hair count</td>
<td>23.9 ± 6.7</td>
<td>23.3 ± 10.9</td>
<td>0.9 (NS)</td>
</tr>
<tr>
<td></td>
<td>24.7 ± 6.2</td>
<td>1.7 ± 2.1</td>
<td>0.001*</td>
</tr>
<tr>
<td>White hair Count &amp; density</td>
<td>Increase</td>
<td>12 (50%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td></td>
<td>No change</td>
<td>12 (50%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td></td>
<td>Decrease</td>
<td>0 (0%)</td>
<td>20 (100%)</td>
</tr>
</tbody>
</table>

**only 24 patients in control group and 20 patients in study group have white hair
*Statistically significant difference
NS: no statistically significant difference

Table 3. Independent observer assessment

<table>
<thead>
<tr>
<th></th>
<th>Control (n=44)</th>
<th>Study (n=47)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Increase hair growth</td>
<td>20 (45.5%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td></td>
<td>No change</td>
<td>24 (54.5%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td></td>
<td>Minor (≤20%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td></td>
<td>Mild (20 – 39%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td></td>
<td>Moderate (40 – 59%)</td>
<td>0 (0%)</td>
<td>1 (2.1%)</td>
</tr>
<tr>
<td></td>
<td>Good (60 – 79%)</td>
<td>0 (0%)</td>
<td>14 (29.8%)</td>
</tr>
<tr>
<td></td>
<td>Excellent (80 – 100%)</td>
<td>0 (0%)</td>
<td>32 (68.1%)</td>
</tr>
</tbody>
</table>

*Statistically significant difference
NS: no statistically significant difference

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DISCUSSION

In the present study C. rotundus oil used as topical treatment twice per day for six months. C. rotundus essential oil preparation was found to be significantly more effective than the placebo in hirsute females with (mustache & chin) or in axillary hair in normal females. Three assessment methods were employed: difference in hair count, independent observer and last patients’ self assessment of the condition before and 6 months after initiation of treatment.

The growth of sexual hair is entirely dependent on the presence of androgen (Androgenic hair) [1-5]. Flavonoids have an estrogenic activity [34]. Flavonoids and lignans (which are constituents of many plants) could inhibit 5 alpha-reductase and 17 beta-hydroxysteroid dehydrogenase [17]. Flavonoids are found in many herbs such as C. rotundus [25, 26, 35], which inhibit 5a–reductase enzyme [17]. But, topical usage of oil did not affect the serum level of testosterone or ovarian ultrasonic pictures.

Removing white hair showed a great challenge in the

Table 4. Patients’ self assessment of area covering

<table>
<thead>
<tr>
<th>Area covering (assessed by patients)</th>
<th>Control (n=44)</th>
<th>Study (n=47)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase covering</td>
<td>26 (59.1%)</td>
<td>0 (0%)</td>
<td>0.001*</td>
</tr>
<tr>
<td>No change</td>
<td>18 (40.9%)</td>
<td>0 (0%)</td>
<td>0.001*</td>
</tr>
<tr>
<td>Mild decrease (&lt;25%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>-</td>
</tr>
<tr>
<td>Moderate decrease (25 - 49%)</td>
<td>0 (0%)</td>
<td>1 (2.1%)</td>
<td>0.9 (NS)</td>
</tr>
<tr>
<td>Good decrease (50 - 75%)</td>
<td>0 (0%)</td>
<td>14 (29.8%)</td>
<td>0.003*</td>
</tr>
<tr>
<td>Excellent (&gt;75%)</td>
<td>0 (0%)</td>
<td>32 (68.1%)</td>
<td>0.001*</td>
</tr>
</tbody>
</table>

*Statistically significant difference
NS: no statistically significant difference

Table 5. Patients’ self assessment of hair quality

<table>
<thead>
<tr>
<th>Rate of hair growth</th>
<th>Control (n=44)</th>
<th>Study (n=47)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase</td>
<td>26 (59.1%)</td>
<td>0 (0%)</td>
<td>0.001*</td>
</tr>
<tr>
<td>No change</td>
<td>18 (40.9%)</td>
<td>0 (0%)</td>
<td>0.001*</td>
</tr>
<tr>
<td>Decrease</td>
<td>0 (0%)</td>
<td>47 (100%)</td>
<td>0.001*</td>
</tr>
</tbody>
</table>

*Statistically significant difference
NS: no statistically significant difference

Area under the curve = 83%
Standard error = 0.07
95% CI = 0.7 – 0.9
P-value = 0.001* (Statistically significant)

Hair count before treatment ≤ 21 can be used as predictor
for complete cure after treatment with the following characteristics

- Sensitivity = 72% 95% CI = 53.3 – 86.2
- Specificity = 80% 95% CI = 51.9 – 95.4
- Positive predictive value = 88.5%
- Negative predictive value = 57.1%
- Positive likelihood ratio = 3.59
- Negative likelihood ratio = 0.3

Graph 3. ROC curve analysis to detect cut off value of hair count before treatment to predict cure:

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previous decades, because of its irresponsiveness to LASER or IPL. Hair coloring is an efficient and feasible technique that can be combined with IPL to eliminate white facial hair [37]. Also Melanin-encapsulated liposomal spray in combination with diode laser treatment showed a significant higher efficacy in the treatment of white and blond hair [37]. In the present study, there was a significant decrease of white hair by *C. rotundus* oil which is an easy, cheap, and harmless treatment.

In the present study, independent observer assessment and patients’ self assessment were high compared to results of hair count. Changes in the apparent skin covering is not only due to decrease in the number of hair, but also due to thinning of hair, color, and shine, which the patients reported to decrease greatly.

Laser is the most expensive method, followed by IPL, Efornithine HCl 13.9% cream then electrolysis [38]. In this study, *C. rotundus* oil cost is about 1 dollar per month, which was the cheapest choice. Side effects reported were minimal. No cases reported infection, irritation, itching or dis-pigmentation.

This study which involved new treatment, raises a lot of questions which will generate a lot of future research.

**CONCLUSION**

*C. rotundus* essential oil has anti-androgenic activity on androgenic hair; this may be due to flavonoids. But without affecting serum testosterone. It is an effective method in treating moderate degrees of Androgenic hair (hirsutism and axillary hair), further studies using *C. rotundus* essential oil are recommended.

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**REFERENCES**


