

Hair Growth-Promoting Effects of *Phyllanthus emblica* (Indian gooseberry) Oil in Human Subjects with Alopecia in Cebu City, Philippines

Barcinas, Nikki Nina*; Cedeño, Charmaine Pearl; Dobariya, Ishan; Ilustre, Patricia Theresa Ira; Madathanapalli, Sree; Pertimos, Neil Aldrin; Tabañag, Khryssly Zoe

Matias H. Aznar Memorial College of Medicine
Redemptorist Plaza, Camputhaw
Cebu City, Philippines 6000

ABSTRACT

Alopecia is a significant hair problem worldwide. *Phyllanthus emblica*, commonly known as Indian gooseberry, is one of the most important medicinal plants in Indian traditional systems of medicine. *Phyllanthus emblica* is a potent 5 α -reductase inhibitor and hair growth promoter. The main objective of the study is to determine the efficacy of *Phyllanthus emblica* oil in promoting hair growth. The study utilizes a true experimental research design on human subjects. Human subjects with alopecia were recruited and randomly divided into 2 groups. Group A was treated with *Phyllanthus emblica* oil and Group B was treated with castor oil. The mean change in hair length and rate of hair growth in both groups were monitored by measurement of the hair length using a tape measure on a weekly basis. The extracts of *Phyllanthus emblica* hair oil significantly increased hair growth of ($p < 0.05$) human subjects with alopecia. The rate of hair growth in Group A (*Phyllanthus emblica*) is 1.58 cm/month, and 1.1 cm/month for Group B (Castor Oil). Therefore, the rate of hair growth is faster in Group A (*Phyllanthus emblica*) compared with Group B (Castor oil). This study showed that the extracts of *Phyllanthus emblica* oil is effective in promoting hair growth in human subjects with alopecia in Cebu City. In addition, Castor oil was also able to exert a hair growing-effect. However, *Phyllanthus emblica* oil has a faster rate of hair growth compared with Castor oil throughout the course of the experiment.

Keywords: Alopecia, *Phyllanthus emblica*, Castor oil

INTRODUCTION

Hair loss distresses self-confidence, affecting the individual's quality of life. The annual years of healthy life lost per 100,000 people from alopecia areata in the Philippines has increased by 9.9% since 1990, an average of 0.4% a year. Alopecia is the acquired condition of recognizable hair loss (Trueb, 2016). Genetic predisposition and androgen dependence are important characteristics of the common patterned loss of scalp hair known as male pattern baldness. The involvement of the 5 α -reductase enzyme in male pattern baldness has been postulated due to its role in the metabolism of testosterone to dihydrotestosterone (DHT). A study has shown that *Phyllanthus emblica* is a potent 5 α -

reductase inhibitor and hair growth promoter (Kumar et al. 2012). The 5 α -reductase enzyme converts testosterone to DHT. The DHT binds to receptors in the follicle. This complex leads to the production of cell specific messenger RNA, which helps in the synthesis of specific follicle damaging proteins. This leads to the progressive miniaturization of hair with each successive hair cycle (Bouhanna and Bouhanna, 2016). Blocking the 5 α -reductase enzyme lowers DHT levels, thus reducing hair loss (Kumar et al. 2012).

This study explores the potential of *Phyllanthus emblica* in the promotion of hair growth. The study is significant to the people and physicians for the prevention and treatment of

alopecia. Furthermore, it could be used by pharmaceutical companies and future researchers for the development of other hair growth-promoting drugs.

The general objective of the study is to determine the efficacy of *Phyllanthus emblica* extract in promoting hair growth. The specific objectives include: (1) To determine the baseline hair length measurements of the twenty (20) subjects before treatment, (2) To determine the mean change of hair length of twenty (20) subjects divided into two equal groups (Group A - *Phyllanthus emblica* oil and Group B - Castor oil) per week for four weeks, (3) To determine the mean change of hair length of each group after the course of the experiment, (4) To determine whether there is a significant increase in the mean change of hair length, (5) To determine the rate of hair length increase of Group A - *Phyllanthus emblica* oil and Group B - Castor oil, and (6) To compare the rate of hair length increase of Group A - *Phyllanthus emblica* oil and Group B - Castor oil.

The study utilizes a true experimental research design on human subjects. Human subjects with alopecia were recruited and randomly divided into 2 groups. Group A was treated with *Phyllanthus emblica* oil and Group B was treated with castor oil. The extracts of the *Phyllanthus Emblica* oil and the castor oil was applied twice daily for 4 weeks. The mean change in hair length and rate of hair growth in both groups were monitored by measurement of the hair length using a tape measure on a weekly basis.

The extracts of *Phyllanthus emblica* hair oil significantly increased hair growth of ($p < 0.05$) human subjects with alopecia. The rate of hair growth in Group A (*Phyllanthus emblica*) is 1.58 cm/month, and 1.1 cm/month for Group B (Castor Oil). Therefore, the rate of hair growth is faster in Group A (*Phyllanthus emblica*) compared with Group B (Castor oil).

MATERIALS AND METHODS

The study utilized a true experimental research design on human subjects. Human subjects with alopecia (ages 25-45, of any gender) were recruited and randomly divided into 2 groups: Group A (*Phyllanthus emblica* oil) and Group B (Castor oil) groups. Group A was treated with *Phyllanthus emblica* oil and Group B was treated with castor oil.

The entirety of the research experiment covered 4 weeks and was conducted within Cebu City, Philippines.

Fruits (young) of *Phyllanthus emblica* were collected from Farm Villages of Gujarat in India. The plants were verified and authenticated by The Ministry of Agriculture and Farmers Welfare under the Government of India. The fruits were cleaned and allowed to air dry at room temperature for 14 days. Three kilograms of dried fruit was mixed with 5 liters of 95% ethanol. The alcoholic extract was decanted then processed using ROTAVAP (rotary evaporator) under 55°C. The crude extract (300 ml) was dried using a waterbath and 15 g of residue was obtained. The residue was boiled with 1500 mL coconut oil. The concentration is 10 mg/mL. The oil was then stored in medicine bottles with droppers (10 pieces) at room temperature.

The researchers used the protocol that was approved by the Ethics Review Committee before using humans as research subjects. Informed consent was obtained from 20 volunteers with alopecia. The subjects underwent skin testing to determine any allergic reaction before starting the experiment. Presence of reaction (e.g. redness) on the skin means that the human subject must not proceed with the experiment.

Phyllanthus emblica oil was used to treat Group A and castor oil was used to treat Group B. A few drops sufficient enough to cover the affected area was applied 2 times a day, in the morning after shower and at night before sleeping. The mean change in hair length and rate of hair growth in both groups were monitored by measurement of the hair length using a tape measure on a weekly basis.

The mean increase of hair lengths of both groups were calculated per week. The results were analyzed using t-test. This tool is used to determine whether there is a significant difference between the means of two groups. The results are considered statistically significant if $p < 0.05$.

RESULTS AND DISCUSSION

Hair loss commonly affects men due to an X-linked inheritance. This study aims to conduct an experiment that minimizes the cases of alopecia in the Philippines using *Phyllanthus emblica* oil, which is a potent 5 α -reductase inhibitor and hair growth

promoter. Patients with alopecia were randomly selected based on their age and gender. Subjects underwent assessment and skin testing to check for any allergic reaction to the oil. The subjects were divided into Group A (*Phyllanthus emblica* oil) and Group B (Castor oil) and treated with the respective oils. The mean change in hair length and rate of hair growth in both groups were monitored by measurement of the hair length on a weekly basis. The statistical tool used to analyze the data is T-test which is used to determine whether there is a significant difference between the means of two variables.

Table 4.1. Weekly measurement of hair lengths of each participant from Group A.

Group A (<i>Phyllanthus emblica</i> oil)					
Participant	Initial measurement (cm)	Week 1 (cm)	Week 2 (cm)	Week 3 (cm)	Week 4 (cm)
1	0.6	0.9	1.3	1.7	2.1
2	26.0	26.4	26.8	27.2	27.6
3	1.3	1.7	2.1	2.5	2.9
4	33.8	34.2	34.6	35.0	35.4
5	2.5	2.8	3.1	3.4	3.7
6	1.2	1.5	1.8	2.2	2.6
7	0.1	0.4	0.7	2.0	2.3
8	0.3	0.6	1.0	1.4	1.8
9	3.4	3.8	4.2	4.6	5.0
10	10.4	10.8	11.2	11.6	12.0

. Table 4.1 depicts hair length results of each participant from Group A (*Phyllanthus emblica* oil) was measured each week. Based on the results gathered, factors that may have altered the results include the amount of oil used per day and participant compliance. The initial hair lengths of the participants are greatly varied because the selection of participants are random and some were females who had longer hair to start with.

Table 4.2. Difference of hair lengths from the initial measurement to each week of each participant from Group A.

Group A (<i>Phyllanthus emblica</i> oil)				
Participant	Difference from initial to Week 1 (cm)	Difference from Initial to Week 2 (cm)	Difference from Initial to Week 3 (cm)	Difference from Initial to Week 4 (cm)
1	0.3	0.7	1.1	1.5
2	0.4	0.8	1.2	1.6
3	0.4	0.8	1.2	1.6
4	0.4	0.8	1.2	1.6
5	0.3	0.6	0.9	1.2
6	0.3	0.6	1.0	1.4
7	0.3	0.6	1.9	2.2
8	0.3	0.7	1.1	1.5
9	0.4	0.8	1.2	1.6
10	0.4	0.6	1.2	1.6
Mean hair length increase	0.35	0.72	1.2	1.58

Table 4.2 shows the difference of hair lengths from the initial measurement to each week of each participant from Group A. From initial measurement to Week 1, the mean hair length cumulative increase is 0.35 cm. From initial measurement to Week 2, the mean hair length cumulative increase is 0.72 cm. From initial measurement to Week 3, the mean hair length cumulative increase is 1.2 cm. Lastly, from initial measurement to Week 4, the mean hair length cumulative increase is 1.58 cm. Therefore, participants treated with *Phyllanthus emblica* oil had a rate of hair growth of 1.58 cm/month(4 weeks) or 0.40 cm/week.

Table 4.3. Weekly measurement of hair lengths of each participant from Group B.

Group B (Castor Oil)					
Participant	Initial measurement (cm)	Week 1 (cm)	Week 2 (cm)	Week 3 (cm)	Week 4 (cm)
1	46.3	46.6	46.9	47.2	47.5
2	44.7	44.9	45.2	45.5	45.8
3	0.1	0.3	0.5	0.7	0.9
4	5.5	5.9	6.3	6.7	7.1
5	28.0	28.3	28.6	29.0	29.4
6	34.2	34.5	34.8	35.1	35.4
7	22.4	22.8	23.2	23.6	24.0
8	35.7	36.0	36.3	36.7	37.1
9	25.2	25.5	25.8	26.1	26.4
10	0.3	0.6	0.9	1.2	1.6

Table 4.3 depicts the results of the measurements. Same factors may have altered the results such as participant compliance. Many participants in this group have a high initial measurement due to the random selection of participants who were females with longer hair.

Table 4.4. Difference of hair lengths from the initial measurement to each week of each participant from Group B.

Group B (Castor Oil)				
Participant	Difference from Initial to Week 1 (cm)	Difference from Initial to Week 2 (cm)	Difference from Initial to Week 3 (cm)	Difference from Initial to Week 4 (cm)
1	0.3	0.6	0.9	1.2
2	0.2	0.5	0.8	1.1
3	0.2	0.4	0.6	0.8
4	0.4	0.8	1.2	1.6
5	0.3	0.6	1.0	1.4
6	0.3	0.6	0.9	1.2
7	0.4	0.8	1.2	1.6
8	0.3	0.6	1.0	1.4
9	0.3	0.6	0.9	1.2
10	0.3	0.6	0.9	1.3
Mean hair length increase-se	0.30	0.61	0.94	1.28

Table 4.4 shows the difference of hair lengths from the initial measurement to each week of each participant from Group B. From initial measurement to Week 1, the mean hair length cumulative increase is 0.30 cm. From initial measurement to Week 2, the mean hair length cumulative increase is 0.61 cm. From initial measurement to Week 3, the mean hair length cumulative increase is 0.94 cm. Lastly, from initial measurement to Week 4, the mean hair length cumulative increase is 1.28 cm. Therefore, participants treated with castor oil had a rate of hair growth of 1.28 cm/month(4 weeks) or 0.32 cm/week.

Table 4.5. Mean hair length (cm) cumulative increase for 4 weeks of Group A and Group B with standard deviation.

	Group A (<i>Phyllanthus emblica</i> oil)		Group B (Castor Oil)	
	Mean	Standard Deviation	Mean	Standard Deviation
Week 1	0.35	0.053	0.3	0.067
Week 2	0.72	0.092	0.61	0.120
Week 3	1.2	0.267	0.94	0.178
Week 4	1.58	0.253	1.28	0.240

Table 4.5 shows the comparison of the cumulative increase of mean hair lengths of Group A and Group B for 4 weeks with standard deviation. In Week 1, Week 2, Week 3, and Week 4, the mean hair length cumulative increase of Group A (*Phyllanthus emblica* oil) is higher compared with Group B (Castor oil). Overall, the rate of hair growth of Group A (1.58 cm/month) is higher than Group B (1.28 cm/month).

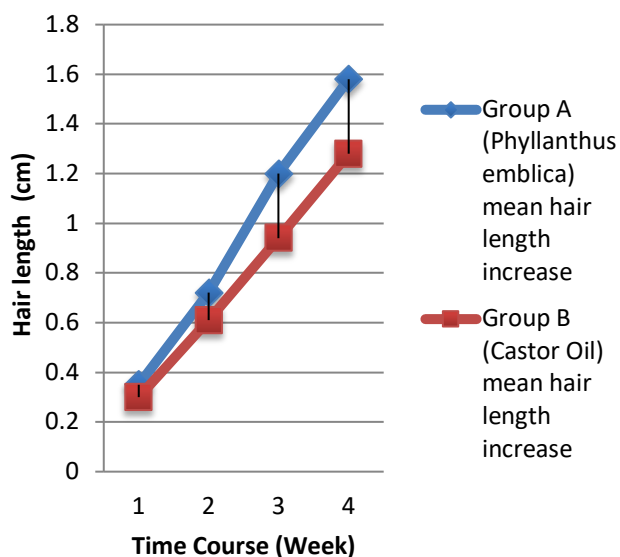


Figure 4.1. Mean hair length increase (cm) for 4 weeks of Group A and Group B

Figure 4.1 shows the mean length in centimeters of Group A (*Phyllanthus emblica*) and Group B (Castor Oil) per week for 4 weeks. The mean hair length increase of Group A for Week 1 is 0.35 cm, Week 2 is 0.37, Week 3 is 0.68 and Week 4 is 0.60. For Group B, the mean hair length increase for Week 1 is 0.30, Week 2 is 0.31, Week 3 is 0.33 and Week 4 is 0.34. The rate of hair growth is the basis for determining the efficacy of each group. The rate of hair growth is faster in Group A compared with Group B.

The statistical tool used to analyze the data is T-test. T-test is a tool is used to determine whether there is a significant difference between the means of two variables. Table 4.6 depicts the results of the statistical tool including the p-value, effect size, power, decision on H_0 , and interpretation.

Table 4.6. Independent T test analysis per Week

	t	df	p value	Effect size	Power	Decision	Interpretation
Week 1	1.861	18	0.079	0.83	0.42	Fail to Reject H_0	Not Significant
Week 2	2.305	18	0.033	1.03	0.54	Reject H_0	Significant
Week 3	2.566	18	0.019	1.15	0.68	Reject H_0	Significant
Week 4	2.724	18	0.014	1.22	0.73	Reject H_0	Significant

$p < .05 = \text{significant}$

Effect size measures the strength of the effect of the treatment on hair growth. Effect size of greater than 0.8 means that there is very strong

effect. Power refers to how strong the statistical power is in reference to the sample size. Power should be above 0.70 to be considered “powerful”. The result is “powerful” since at Week 4 the power is 0.73.

Results show that at Week 2 there is already a significant difference in terms of increase in hair length. The difference became greater at Week 3, as well as with Week 4 which showed greater significance. There is a significant difference in the hair growth between Group A and Group B, and that Group A (*Phyllanthus emblica* oil) showed the higher increase compared to Group B (Castor oil),

CONCLUSION

This study showed that the extracts of *Phyllanthus emblica* oil is effective in promoting hair growth in human subjects with alopecia in Cebu City. In addition, Castor oil was also able to exert a hair growing-effect. However, *Phyllanthus emblica* oil has a faster rate of hair growth compared with Castor oil throughout the course of the experiment.

Phyllanthus emblica oil is a potent 5 α -reductase inhibitor and hair growth promoter. Therefore, the results suggest that *Phyllanthus emblica* oil may be used in people with alopecia. However, further research is needed to gain a better understanding of its potential therapeutic action, the implicated phytochemical constituents, and the extracts mechanism of action.

LITERATURE CITED

- Alopecia Areata in Philippines Statistics on Overall Impact and Specific Effect on Demographic Groups. (n.d.). Global Disease Burden: Alopecia Areata in the Philippines. Retrieved from <https://www.hairbuddha.net/make-amlai-hair-oil/>
- Bhandari, P., and Kamdod, M. (2012). Emblica officinalis (Amla): A review of potential

- therapeutic applications. *International Journal of Green Pharmacy*, 6(4), 257.
- Bouhanna, P., and Bouhanna, E. (2016). *The Alopecias: Diagnosis and Treatments*. Boca Raton: CRC Press, Taylor & Francis Group.
- Charmkar, N. K., and Singh, R. (2017). *Emblica officinalis* Gaertn. (Amla): A Wonder Gift of Nature to Humans. *International Journal of Current Microbiology and Applied Sciences*, 6(7), 4267-4280.
- Chemotherapy and hair loss: What to expect during treatment. (2016, April 05): *Chemotherapy In Depth Hair Loss*.
- Csedö, C. & Rusu, M. ,(n.d.). *Phytochemical Study of Various Sorts of Castor Oil in Dermatologic Products: Doctoral dissertation*.
- Dasaroju, S., and Gottumukkala, K. M. (2014). Current Trends in the Research of *Emblica officinalis* (Amla): A Pharmacological Perspective. *International Journal of Pharmaceutical Sciences Review and Research*, 24(2), 150-159.
- Ellis, J. and Harrap, S. (1998), Genetic Analysis on Male Pattern Baldness and the 5 α -Reductase Genes; *Investigative Dermatology*.
- Fenderson, B.A. (2001), *Developmental and Genetic Diseases: Pathology Secrets* (Third Edition)
- Hasan, M. R., Islam, M. N., and Islam, M. R. (2016). Phytochemistry, pharmacological activities and traditional uses of *Emblica officinalis*: A review. *International Current Pharmaceutical Journal*, 5(2), 14.
- Jain, P. K., Das, D., and Ak, S. (2016). Alternative herbal drugs used for treating hair disease. *Asian Journal of Pharmaceutical and clinical research*, 9(1).
- Kim, J., Lask, G. P., and Nelson, A. (2012). *Comprehensive Aesthetic Rejuvenation: A Regional Approach*. New York: Informa Healthcare.
- Kumar, N., Rungseevijitprapa, W., Narkkhong, N., Suttajit, M., and Chaivasut, C. (2012). 5 α -reductase inhibition and hair growth promotion of some Thai plants traditionally used for hair treatment. *Journal of Ethnopharmacology*, 139(3), 765-771.
- Le Roux, B.T., Lowether, C.E., and Mukheibir, S.C.(n.d.). Preoperative preparation of the skin with a depilatory. *S Afr Med J*. 49(42): 1761-2
- Liu, X., *et al.* (2012). Immunomodulatory and anticancer activities of phenolics from emblica fruit (*Phyllanthus emblica* L.), *Food Chem*. 131, 685-690, 2012.
- Lim, D., Kim, J., and Kim, Y. (2016). Analgesic Effect of Indian Gooseberry (*Emblica officinalis* Fruit) Extracts on Postoperative and Neuropathic Pain in Rats. *Nutrients*, 8(12), 760.
- Lourith, N., and Kanlayavattanukul, M. (2013). Hair Loss and Herbs for Treatment. *Journal of Cosmetic Dermatology*, 12(3), 210-222.
- Mackenzie, L., Mars, L., Thatcher, K., & Moody, J. (2015). *The Complete Directory for Pediatric Disorders*. Armenia, NY: Grey House Publishing.
- Mercola. (2016), 14 Practical reasons to stock a bottle of castor oil at home, Dr. Mercola's Natural Health Newsletter.
- Merriam, J. (2001), *Mendelian Inheritance; Encyclopedia of Genetics*
- Mohile, R.B. (2003). Effect of mineral oil, sunflower oil, and coconut oil on prevention of hair damage , Research and Development Department, Nature Care Division, Marico Industries Ltd., Mumbai, India.
- Naissance Journals. (n.d.) 3 top oil and methods for improving your hair condition.
- Ogunniyi, D. (2006). Castor oil: A vital industrial raw material. *Bioresource Technology*, 97(9), 1086-1091.

- Penzel, F. (2003). *The Hair-pulling Problem: a Complete Guide to Trichotillomania*. New York: Oxford University Press.
- Rettner, R. (2017), Baldness Linked Genetic Markers; Live Science
- Rudnicka, L., Olszewska, M., and Rakowska, A. (2012). *Atlas of Trichoscopy Dermoscopy in Hair and Scalp Disease*. London: Springer London, 4(7), 32-33.
- Rusu, M., Csedő, C., Marcus, G., Lupuliasa, D. (2008). Preclinical Study on The Hair growth And Regeneration Of External Use Lotions Containing Castor Oil (*Ricini Oleum*) in Rabbits: FARMACIA 56(4).
- Smith, R. P., Netter, F. H., Machado, C. A., and Netter, F. H. (2011). *The Netter Collection of Medical Illustrations*. Philadelphia, PA: Elsevier.
- Srivasuki, K.P. (2012). Nutritional and health care benefits of Amla, *Journal of Pharmacognosy*, 3(2), 141-51.
- Stevens, C. (n.d.). Hair and its Growth Cycle: *Journal of The Trichological Society*.
- Trueb, R. M. (2013). *Female Alopecia: Guide to successful management*. S.l.: Springer-Verlag Berlin Heidelberg, 2(1), 22.
- Ustuner, E. T. (2013). Cause of Androgenic Alopecia. *Plastic and Reconstructive Surgery Global Open*, 1(7).
- Variya, B. C., Bakrania, A. K., and Patel, S. S. (2016). *Emblica officinalis (Amla): A review for its phytochemistry, ethnomedicinal uses and medicinal potentials with respect to molecular mechanisms*. *Pharmacological Research*, 111, 180-200.
- White, R., and McIntosh, C. (2009). A review of the literature on topical therapies for diabetic foot ulcers. Part 2: Advanced treatments. *Journal of Wound Care*, 18(8), 335-341.