Mediterranean Journal of
Pharmacy & Pharmaceutical Sciences
www.medjpps.com

ISSN: 2789-1895 online
ISSN: 2958-3101 print

ORIGINAL RESEARCH article

Hair growth promotion effect of Saidi Libyan date seed cultivar

Nahla S. Labyad [*], **Abdulmuez A. Alqeblawi**, and **Taha H. El Sheredi**

Department of Pharmacognosy, Faculty of Pharmacy, University of Tripoli, Tripoli, Libya
[*] Author to whom correspondence should be addressed

Article number: 212, **Received:** 18-04-2025, **Accepted:** 29-06-2025, **Published online:** 30-06-2025

HOW TO CITE THIS
Labyad et al. (2025) Hair growth promotion effect of Saidi Libyan date seed cultivar.
Mediterr J Pharm Pharm Sci. 5(2): 152-159. [Article number: 212]. https://doi.org/10.5281/zenodo.15769937

Keywords: Hair, growth, Libyan, Saidi, seed extract, oil

Abstract: The *Phoenix dactylifera*, commonly known as the date palm, is a widely cultivated plant recognized for its nutritional and medicinal properties. It has gained attention for its potential role in cosmetic applications. Date seeds contain abundant phytochemicals that may function as potent phytomedicines. In this study, topical application of Saidi date seed methanolic extract (20.0%, 15.0%, and 10.0% v/v) and pure seed oil to the dorsal skin of four male rabbits demonstrated significant hair growth effects. Throughout the evaluation period (days 7, 14, and 21), the pure seed oil produced the greatest increase in hair length (2.64 mm), exceedingly even the positive control (2.0% minoxidil, 1.962 mm). The methanolic extract induced concentration-dependent growth, with values of 2.295 mm, 2.01 mm, and 1.92 mm for 20.0%, 15.0%, and 10.0%, respectively. Hair mass measurements on day 22 corroborated these findings, with the highest weight recorded for the oil (0.347 g), followed by the positive control. In conclusion, the study reveals the potent hair growth activity of Saidi seed oil and methanolic extract, highlighting their potential as natural alternatives for hair loss treatment.

Introduction

Over the past decade, scientific interest has surged in exploring natural remedies and plant-derived extracts for preventing and treating hair loss. Many plants, long revered in global cultures for their hair-restorative properties, are now being validated by modern research for their efficacy, biocompatibility, and reduced risk of adverse effects [1]. Among the plants used for promoting their hair growth, such as *Rosmarinus officinalis,* a cornerstone of Mediterranean herbal medicine, rosemary has demonstrated clinically significant improvements in hair density, particularly in cases of androgenetic alopecia [2]. Furthermore, *Allium cepa* L. and *Allium sativum* L., rich in sulfur and containing antioxidants and antimicrobial agents, these plants have been traditionally applied topically to treat alopecia areata, with studies suggesting their ability to reactivate dormant follicles [3]. Additionally, *Panax ginseng*, which is widely used in East Asian medicine, for its anti-inflammatory and antioxidant properties which are linked to its capacity to prolong the hair growth phase (anagen) and counteract stress-induced shedding [4]. Lastly, *Zingiber officinale* has been a staple in Chinese hair care, valued for its stimulating effects on scalp circulation and potential to reduce follicular inflammation [5]. Recently, research highlighted the role of *Ginkgo biloba* polysaccharides in promoting hair growth, likely through enhancing nutrient delivery to follicles and mitigating oxidative stress [6].

ISSN: 2789-1895 online
ISSN: 2958-3101 print

The literature highlights the therapeutic potential of phytochemicals derived from date seeds (*Phoenix dactylifera*), underscoring their multifaceted benefits for human health [7]. Notably, the management of hair loss using synthetic drugs (e.g., minoxidil, finasteride) remains fraught with challenges, including high costs, long-term dependency, and adverse effects such as scalp irritation, hormonal imbalances, and diminished efficacy over time [1]. These limitations necessitate the exploration of natural, affordable, and safer alternatives. Date seeds, often discarded as agricultural waste, emerge as a promising candidate due to their rich bioactive profile and untapped potential. Transforming this underutilized byproduct into a functional therapeutic agent aligns with global sustainability goals while addressing the urgent need for accessible hair loss solutions. Scientific studies have documented the hair growth-promoting properties of date fruits and their seeds, which have traditionally been formulated into waterproof hair tonics and UV-protective creams to enhance hair strength and resilience [8, 9]. The Libyan date palm seed varieties represent a particularly valuable resource, as their fruits come from fleshy coastal types, semi-soft varieties, and less succulent cultivars [10]. These seeds are rich in bioactive phytochemicals, including phenolic compounds, flavonoids, saponins [11], fixed oil, and steroids [12], which display their diverse biological activities as antimicrobial [13], and antioxidant effects [14, 15], while developing evidence highlights their potential in cosmeceutical applications. For instance, antioxidant phenolics and UV-absorbing flavonoids in date seeds may protect hair from environmental damage, while saponins and fixed oils could stimulate follicular activity and improve scalp health [1]. This study was designed to investigate the hair growth-promoting potential of seed extracts and oil locally termed Saidi in Libyan cultivars and to evaluate their viability as natural nutraceutical and pharmaceutical agents.

Materials and methods

Sample collection: The date (fruits) at the tmar stage which was locally known as Saidi, was originally collected from Al-wahat Jalo oases, Libya, were deseeded by removing the seeds and kept in a dry clean place.

Sample preparation: Saidi seeds (1.0 kg) were sun-dried for one week during summer then heated in an oven at 100 ºC for two hours then roasted and ground into a fine powder, then stored in the glass in an airtight container.

Sample extraction: 200 mg of seed powder was immersed in 500 mL of methanol and left for 72 hrs at 25°C-30°C with periodic stirring. The mixture was then sonicated for 60 min at 30°C using an ultrasonic bath (Bandelin Sonorex 255 H). After filtration, the filtrate remained under the hood until get dried completely. The methanolic extract residues were stored in a cool place for study experiments. To make the extract ready to be given topically to the test animals, the methanolic extract of seeds was sonicated and suspended in distilled water at concentrations by those set for treatment, 20.0% v/v, 15.0% v/v, and 10.0% v/v, respectively, up to a final volume of 20 ml. The carboxymethyl cellulose (CMC) was added to suspension little by little while stirring until the topical gel formed.

In vitro study: Four healthy adult male New Zealand rabbits, aged 4-5 months, weighing between 1.2 kg and 1.5 kg were used for the study. Both during the acclimation period and throughout the treatment [16], the rabbits were individually housed in a room with a natural light cycle with a temperature range of 25°C-30°C and fed with a normal diet and water. Hair growth was assessed using a standardized literature protocol [17].

Ethics approval: The study was approved by the University of Tripoli Scientific Research Committee (SREC/010/105). For acute dermal toxicity testing, the highest concentrations of seed extract and date seed oil were applied topically to the ears of rabbits. No adverse reactions (e.g., erythema, edema, epidermal irritation) occurred during the observation period [18, 19].

ISSN: 2789-1895 online
ISSN: 2958-3101 print

The dorsal aspect of each rabbit was divided into six 2 cm × 2 cm treatment areas. The hair on each area was shaved using an electric razor, and the skin was marked as C0 (negative control), C1 (positive control, 2.0% Minoxidil), O (seed oil), and seeds methanolic extract as S1 (20.0%v/v), S2 (15.0%v/v), and S3 (10.0%v/v). The treatments were applied topically to the designated areas.

Gel Administrations: The CMC gel containing extract and pure seeds oil sample (0.1 g/shaved area) were administered topically on the animal-shaved skin, twice a day (morning and afternoon), for 21 days. On days 7, 14, and 21 each treated area was taken randomly 10 hairs and the length of each hair was measured using a caliper. On day 22, all hairs in the treated area were taken and weighed using a digital microbalance.

Statistical analysis: The statistical analysis was carried out with IBM SPSS® 22, and One-way Analysis of Variance (ANOVA) was used to determine the statistical significance of the differences between values of various experimental and control groups. A P value of less than 0.05 was considered significant.

Results

The current study evaluated the hair growth-promoting effects of three distinct concentrations of Saidi seed methanolic extract (SSME) and seed oil (percentage of yield 13.0%), comparing their efficacy against negative and positive controls. Hair growth measurements following topical treatments across the 21 days with different concentrations of SSME (20.0%v/v, 15.0%v/v, and 10.0% v/v), seed oil (100%), and controls are displayed in tables. In **Table 1**, on day 7, measurements revealed the highest growth in seed oil (1.908±0.271 mm) compared to a positive control (1.468±0.194 mm). The results of seed extracts exhibited concentration-dependent growth, where 20.0% extract reached 1.725±0.099 mm, while 15.0% reached 1.541±0.060 and ended with 10.0% extract showed 1.415±0.093 mm.

Table 1: Hair growth on day 7 after daily topical treatment with various concentrations of seed extract and oil

Treatment	Rabbits' hair length mm				
	R1	R2	R3	R4	Mean±SD
C-	0.79	0.81	1.02	0.77	0.848±0.116
S1	1.75	1.77	1.80	1.58	1.725±0.099
S2	1.55	1.58	1.57	1.45	1.541±0.060
S3	1.50	1.38	1.48	1.30	1.415±0.093
O	1.84	2.30	1.81	1.68	1.908±0.271
C+	1.71	1.36	1.53	1.27	1.468±0.194

R1=Rabbit 1, R2=Rabbit 2, R3=Rabbit 3, R4=Rabbit 4, C-; negative control (shaved skin was treated only with CMC gel, without the inclusion of any seed extract or oil) S1; 20.0%, S2, and S3; 10.0% of Saidi seed methanolic extract, O; seed oil, C+: positive control (2.0% Minoxidil).

By day 14, growth trends showed differential responses across treatments (**Table 2**). The negative control exhibited minimal growth (1.058±0.126 mm), while seed extracts displayed a concentration-dependent related efficacy as 20.0% concentration yielded 1.955±0.099mm; 15.0% concentration produced 1.695±0.128 mm; and 10.0% concentration resulted in 1.565±0.096 mm. Moreover, the seed oil treatment maintained the highest growth measurement at 2.255±0.230 mm.

ISSN: 2789-1895 online
ISSN: 2958-3101 print

Table 2: Hair growth on day 14 after daily topical treatment with various concentrations of seed extract and oil

Treatment	Rabbits' hair length mm				
	R1	R2	R3	R4	Mean±SD
C-	1.19	1.02	1.12	0.90	1.058±0.126
S1	1.86	1.80	2.06	2.10	1.955±0.099
S2	1.63	1.60	1.68	1.88	1.695±0.128
S3	1.57	1.43	1.65	1.61	1.565±0.096
O	1.98	2.43	2.15	2.46	2.255±0.230
C+	1.63	1.57	1.66	1.58	1.610 ±0.402

Mean values±SD for Saidi seed methanol extracts (S1; 20.0%, S2 and S3; 10.0%), Saidi seed oil (O); and 2.0% Minoxidil positive control (C+), CMC gel (C-), with highly significant difference (P<0.001)

In **Table 3**, The results on day 21 showed that seed oil maintained the highest growth (2.640±0.370 mm), and the 20.0% extract maintained strong growth (2.295±0.036 mm). Whereas positive control area was maintained after seed oil, S1, and S2 in length with hair growth reached 1.962±0.342 mm.

Table 3: Hair growth on day 21 after daily topical treatment with various concentrations of seed extract and oil

Treatment	Rabbits' hair length mm				
	R1	R2	R3	R4	Mean±SD
C-	1.28	1.12	1.22	0.98	1.150±0.131
S1	1.92	2.05	2.60	2.61	2.295±0.036
S2	1.69	1.69	2.14	2.15	2.01±0.400
S3	1.67	1.50	2.35	2.15	1.920±0.399
O	2.17	2.56	2.77	3.05	2.640±0.370
C+	1.71	1.67	2.40	2.07	1.962±0.342

Mean values±SD for Saidi seed methanol extracts (S1; 20.0%, S2, and S3; 10.0%), Saidi seed oil (O); and 2.0% Minoxidil positive control (C+), CMC gel (C-), with a highly significance difference (P<0.001)

Based on the recognized protocol, the grown hair within the test area was quantitatively assessed by measuring its mass using a precision balance. The results were systematically recorded and summarized in **Table 4** to evaluate hair growth efficacy.

Table 4: Rabbit hair mass on day 22 after daily topical treatment with various concentrations of *Phoenix Dactylifera L.* seed extract and seed oil

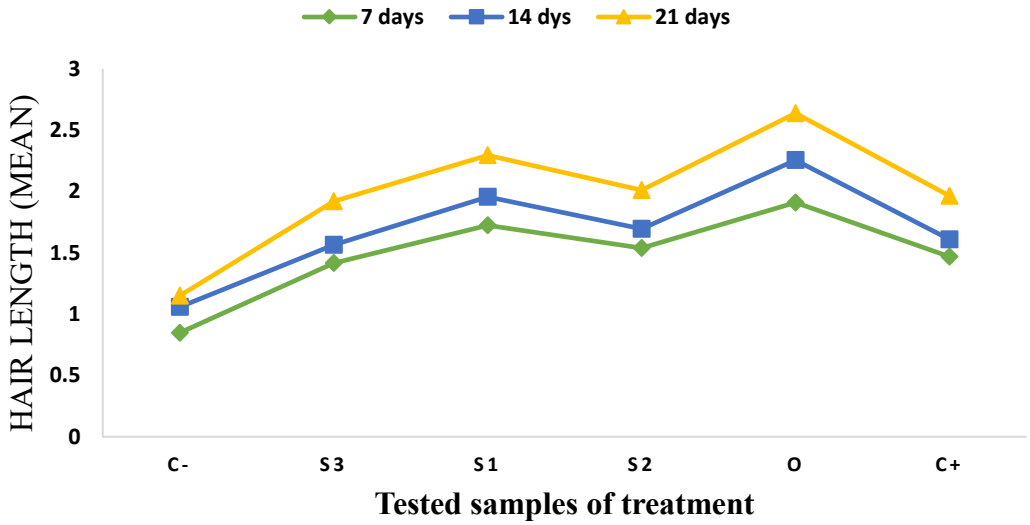
Treatment	Rabbits' hair mass (g)				
	R1	R2	R3	R4	Mean±SD
C-	0.099	0.017	0.039	0.027	0.046±0.037
S1	0.212	0.196	0.223	0.135	0.191±0.093
S2	0.149	0.035	0.044	0.349	0.144±0.146
S3	0.196	0.284	0.244	0.0292	0.188±0.112
O	0.413	0.337	0.329	0.309	0.347±0.046
C+	0.297	0.040	0.224	0.354	0.229±0.137

Mean values ± SD for Saidi seed methanol extracts (S1; 20.0%, S2, and S3; 10.0%), Saidi seed oil (O); and 2.0% Minoxidil positive control (C+), CMC gel (C-), with significance difference (P<0.001)

ISSN: 2789-1895 online
ISSN: 2958-3101 print

The final mass measurements on day 22 revealed distinct treatment effects. Seed oil demonstrated the highest mass accumulation (0.347±0.046 g), followed by the positive standard treatment (0.229±0.137 g). Extract treatments showed reduced efficacy across concentrations (20.0%; 0.191±0.04 g; 15.0%: 0.144±0.146 g; 10.0%: 0.188±0.112 g), while the negative control exhibited the lowest values (0.046±0.037g). A one-way ANOVA test was performed and it found a statistically very highly significant difference ($P<0.001$), between the three test conditions; methanol extract of date palm seeds, seed oil, and used control group.

Figure 1: Hair growth rate throughout the study duration



The changes in hair growth length (mm) as a function of time during the experimental period, where tested samples of treatment are C- (negative control), S3 (20.0%v/v), S2 (15.0% v/v), S1(10.0% v/v), O (100% of oil), and C+ (positive control).

Discussion

Hair loss has become a global concern, influenced by factors such as genetics, hormonal changes, stress, and environmental conditions. While the Food and Drug Administration (FDA) has approved treatments like minoxidil and finasteride, their effectiveness remains limited due to side effects, inconsistent results, and variable patient responses, consequently, this has driven the search for safer, more reliable alternatives [20]. Despite extensive research on various medicinal plants for their potential hair growth benefits [21], no prior in vitro or in vivo studies have systematically evaluated date seed extract or oil for this purpose. While these traditional botanicals have shown varying degrees of efficacy, date seeds remain an underexplored yet promising nutraceutical in the field of hair loss treatment. The date palm seeds (*Phoenix dactylifera* L.), are celebrated for their nutritional and medicinal properties, and have garnered increasing interest in cosmetic science due to their bioactive constituents, which include polyphenols, flavonoids, phenolic acids such as p-coumaric acid, rutin, caffeic acid and quercetin [22, 23]; and fatty-acid-rich oils (lauric acid and oleic acid) [24]. These phytochemicals have demonstrated antioxidant, anti-inflammatory, and follicle-stimulating properties, positioning them as novel agents for improving scalp health and addressing hair loss pathologies [25].

Recent studies explore their ability to counteract oxidative stress in scalp tissues, enhance microcirculation to follicles, and inhibit enzymes like 5-alpha-reductase, which drives androgenetic alopecia [1]. This convergence

ISSN: 2789-1895 online
ISSN: 2958-3101 print

of traditional use and contemporary research underscores the potential of date palm seeds as sustainable, multifunctional ingredients in cosmeceutical formulations targeting hair vitality and regeneration. The results of the current demonstrated that date seed oil and extracts significantly enhanced hair growth over the 21-day period compared to minoxidil treatment. As early as day 7, seed oil showed superior efficacy with 1.91 mm mean growth versus minoxidil's 1.47 mm, while the 20.0% seed extract also exhibited promising results with 1.54 mm. This dose-dependent response became more pronounced over time, with higher extract concentrations consistently yielding better outcomes. By day 21, seed oil achieved a remarkable 2.64 mm mean growth, substantially outperforming all other treatments including minoxidil. Importantly, hair mass measurements confirmed these findings, with seed oil producing the highest density (0.347 g) compared to minoxidil (0.229 g), while the negative control (0.046 g) confirmed the necessity of active compounds. These results collectively recommend that date seed derivatives not only stimulate faster hair elongation but also improve overall hair density, positioning them as potent natural alternatives to conventional hair growth treatments.

The consistent performance advantage of seed oil over extracts indicates its particular promise for therapeutic development and the findings of this study provide that of *Phoenix dactylifera L*. seeds (Saidi), demonstrating a concentration-dependent relationship between the topical application of the seed extracts and rabbit hair growth over time. One of the key findings in the current study was the consistent superiority of the seed oil in promoting both hair length and mass, suggesting a potent therapeutic effect in stimulating follicular activity and improving hair quality. This is supported by prior research emphasizing the role of plant-derived oils in scalp health and enhancing the structural integrity of hair fibers [22, 26]. The hair growth effect of Saidi date seeds oil may be attributed to the oil's high tocol content (tocopherols and tocotrienols) [27], compounds previously linked to hair growth enhancement [28]. Furthermore, Saidi seed extract contains flavonoids known to combat oxidative stress and inflammation, critical factors that impair follicular function [9]. This protective effect is further enhanced by phytosterols, which improve scalp health through strengthened barrier function and reduced inflammatory responses [29]. This study presents the first experimental evidence demonstrating that Libyan date seed oil and extracts significantly enhance hair growth. Specified the well-documented limitations of current pharmaceutical treatments including side effects and inconsistent results our findings position date seed derivatives as a natural alternative worthy of further clinical investigation.

Conclusion: This study has demonstrated the therapeutic potential of Libyan *Phoenix dactylifera* L. (saidi) seed extract and oil as a valuable and effective alternative for hair loss treatment in rabbit. This research has validated the effectiveness of date seed derivatives through systematic experimentation, offering a natural, safe, and locally sourced solution to address additional hair loss management.

References

1. Choi JY, Boo MY, Boo YC. Can plant extracts help prevent hair loss or promote hair. Molecules. 2024; 29(10): 1-37. doi: 10.3390/molecules29102288
2. Luziani S, Darwinata AE, Praharsini IG, Wijaya VO. Rosmarinus officinalis essential oil increases hair length and follicle diameter of ultraviolet b-exposed mice through VEGF. The Indonesian Biomedical Journal. 2023; 15(4): 296-368. doi: 10.18585/inabj.v15i4.2407
3. Sethi A, Alam F, Mishra S. A comprehensive review on medicinal plants for the remedy of hair loss. Research Journal of Pharmacy and Technology. 2023; 16(11): 5497-5501. doi: 10.52711/0974-360X.2023.00889
4. Choi BY. Hair-growth potential of ginseng and its major metabolites: A review on its molecular mechanismsHair-growth potential of ginseng and its major metabolites. International Journal of Molecular Sciences. 2018; 19(9):

ISSN: 2789-1895 online
ISSN: 2958-3101 print

2703. doi: 10.3390/ijms19092703
5. Li T, Zhang G, Zhou X, Guan J, Zhao W, Zheng Y, et al. Cedrol in ginger (Zingiber officinale) as a promising hair growth drug: The effects of oral and external administration on hair regeneration and its mechanism. Bioorganic Chemistry. 2024; 1(151): 107709. doi: 10.1016/j.bioorg.2024.107709
6. Li Y, Sheng Y, Liu J, Xu G, Yu W, Cui Q, et al. Hair-growth promoting effect and anti-inflammatory mechanism of *Ginkgo biloba* polysaccharides. Carbohydrate Polymers. 2022; 15: 278: 118811. doi: 10.1016/j.carbpol.2021. 118811
7. Fernández-López J, Viuda-Martos M, Sayas-Barberá E, Navarro-Rodríguez de Vera C, Pérez-álvarez JÁ. Biological, nutritive, functional and healthy potential of date palm fruit (*Phoenix dactylifera* L.): Current research and future prospects. Agronomy. 2022; 12(4): 876. doi: 10.3390/agronomy12040876
8. Chandra P, Reveny J, Nainggolan M. Formulation and evaluation of hair tonic gel preparations resistance water fraction n-hexan fruit curm (Phoenix Dactylifera L.). Asian Journal of Pharmaceutical Research and Development. 2020; 8(4): 77-80. doi: 10.22270/ajprd.v8i4.772
9. Naureen I, Saleem A, Rana NJ, Ghafoor M, Ali FM, Murad N. Potential health benefit of dates based on human intervention studies: A brief overview. Haya: The Saudi Journal of Life Sciences. 2022; 7(3): 101-111. doi: 10.36348/sjls.2022.v07i03.006
10. Racchi ML, Camussi A. The date palms of Al Jufrah-Libya: A survey on genetic diversity of local varieties. The Journal of Agriculture and Environment for International Development. 2018; 112(1): 161-184. doi: 10.12895/ jaeid.20181.776
11. AL-Tunsi NAM, Eddeif SA, AL-Jenkawi AS, Laswad NA, Eshkourfu RO, Hribesh SO. Determination of some chemical composition of four date seeds from AL-Khums Libya. International Journal of Engineering Research and Technology. 2020; 8(12): 714-716. doi: 10.17577/IJERTV8IS120326
12. Labyad N, Abosilyana A, Almohajer B, Alhommi R. Phytochemical study and proximate analysis of Libyan date seed cultivated in Al-Wahat Jalo oases. Mediterranean Journal of Pharmacy and Pharmaceutical Sciences. 2025; 5(2): 141-145. doi: 10.5281/zenodo.15054019
13. Labyad N, Doro B, Gafri F, Elmaari S, Almusrati N. Phytochemical screening of methanolic extract of five Libyan date varieties (Phoenix dactylifera L.) and evaluation of their antimicrobial activity. International Journal of Progressive Sciences and Technologies. 2020; 22(1): 168-175. doi: 10.52155/ijpsat.v22.1.2017.
14. Swedan A, Auzi A, Lahmer R. Antioxidant-antibacterial properties and nutrition value of some varieties of Libyan date palm fruits (Phoenix dactylifera). Libyan Journal for Agriculture Sciences. 2019; 2(4): 1-24. doi: Nil.
15. Esherif MK, Aljaroushi K, Mohamed A. Biochemical properties evaluation of some Libyan dates. Chemical Review and Letters. 2021; 4(4): 213-220. doi: 10.22034/CRL.2021.299197.1121
16. Bayne K. Revised guide for the care and use of laboratory animals available. American Physiological Society. The Physiologist. 1996; 39(4): 199, 208-211. PMID: 8854724.
17. Kanedi M, Lulus Lande M, Nurcahyani N, Ratna Anggraeni I. Hair-growth promoting activity of plant extracts of suruhan (Peperomia pellucida) in rabbits. IOSR Journal of Pharmacy and Biological Sciences. 2017; 12(5): 18-23. doi: 10.9790/3008-1205061823
18. Kamkaen N, Phuntuwate W, Samee W, Boonrod A, Treesak C. The investigation of the rabbit and human skin irritation of herbal anti-wrinkle cream. Thai Pharmaceutical and Health Sciences Journal. 2007; 2(1): 20-25. doi: Nil.
19. Globally Harmonized System of Classification and Labelling of Chemicals (GHS). Eighth revised edition. UNECE Sustainable Development Goals. New York and Geneva: UNITED NATIONS; 2019. 1-120. doi: Nil.
20. Mateos-Haro M, Novoa-Candia M, Sánchez Vanegas G, Correa-Pérez A, Gaetano Gil A, Fernández-García S, et al. Treatments for alopecia areata: A network meta-analysis. The Cochrane Database of Systematic Reviews. 2023; (10): 1-162. doi: 10.1002/14651858.CD013719
21. Ahmed A, Alali AM, Abdullah E, Alharbi MN, Alayoubi HM. Herbal remedies for hair loss: A review of efficacy and safety. Skin Appendage Disorders. 2025; 1-5 doi: 10.1159/000542876
22. Kageyama T, Seo J, Yan L, Fukuda J. Cinnamic acid promotes elongation of hair peg-like sprouting in hair follicle organoids via oxytocin receptor activation. Scientific Reports. 2024; 14(1): 1-8. doi: 10.1038/s41598-024-55377-y
23. Ourradi H, Ennahli S, Hssaini L, Martos MV, Hernadez F, Hanine H. Date seeds (*Phoenix dactylifera*. L,) in Morocco: Phenolic profiling and in vitro antioxidant potency. Tropical Journal of Natural Product Research. 2022; 6(4): 563-671. doi: 10.26538/tjnpr/v6i4.17
24. Yaiche Achour H, Sidi Mamar A, Saadi SA, Bouras N, Khali M. Chemical characterization of date seeds (Phoenix dactylifera L.) cultivated in algeria for its application as functional ingredients . Acta Universitatis Cibiniensis:

ISSN: 2789-1895 online
ISSN: 2958-3101 print

Series E; Food Technology. 2022; 26(2): 147-156. Doi: 10.2478/aucft-2022-0012.
25. Alharbi KL, Raman J, Shin HJ. Date fruit and seed in nutricosmetics. Cosmetics. 2021; 8(3): 59-67. doi: 10.3390/cosmetics8030059
26. Park S, Lee J. Modulation of hair growth promoting effect by natural products. Pharmaceutics. 2021; 13(12): 2163. doi: 10.3390/pharmaceutics13122163
27. Halabi Y, Nasri C, El Guezzane C, Harhar H, Gharby S, Bellaouchou A, et al. Date palm *Phoenix Dactilifera* L. seed oil: variety effects on physicochemical characteristics, fatty acid composition, sterol and tocol contents. Journal of Microbiology, Biotechnology and Food Sciences. 2023; 12(4): 1-7. doi: 10.55251/jmbfs.5725
28. Beoy LA, Woei WJ, Hay YK. Effects of tocotrienol supplementation on hair growth in human volunteers. Tropical Life of Sciences Research. 2010; 21(2): 91-99. PMID: 24575202; PMCID: PMC3819075.
29. Akhlaq M, Alum MK, Alam MM. Anti-inflammatory potential of medicinal plants. Mediterranean Journal of Pharmacy and Pharmaceutical Sciences. 2022; 2(1): 13-21. doi: 10.5281/zenodo.6399381

Author contribution: NSL conceived, and designed the study. All authors contributed to the collected data. NSL contributed to data analysis and interpretation of data. NSL & THE drafted and reviewed the manuscript for intellectual context. All authors approved the final version of the manuscript and agreed to be accountable for its contents.
Conflict of interest: The authors declare the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.
Ethical issues: The authors observed ethical issues including plagiarism, informed consent, data fabrication or falsification, and double publication or submission.
Data availability statement: The raw data that support the findings of this article are available from the corresponding author upon reasonable request.
Author declarations: The authors confirm that they have followed all relevant ethical guidelines and obtained any necessary IRB and/or ethics committee approvals.
Conflict of interest: The authors declare the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.