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

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

SHORT COMMUNICATION article

Phytochemical study and proximate analysis of Libyan date seed cultivated in Al-Wahat Jalo oases

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Article number: 192, **Received:** 02-02-2025, **Accepted:** 18-03-2025, **Published online:** 20-03-2025

HOW TO CITE THIS

Labyad et al. (2025) Phytochemical study and proximate analysis of Libyan date seed cultivated in Al-Wahat Jalo oases. Mediterr J Pharm Pharm Sci. 5 (2): 116-120. [Article number: 192]. https://doi.org/10.5281/zenodo.15054019

***Keywords*:** Date seed, Libya, phytochemicals, proximate

Abstract: Date palm (*Phoenix dactylifera L.*) seeds, often regarded as agricultural byproducts, have recently garnered scientific interest due to their rich profile of bioactive compounds. In this study, Libyan date seeds from three cultivars (Saidi, Hamarai, and Degla) were analyzed to evaluate their physicochemical properties, including moisture, protein, ash, and phytochemical constituents. Phytochemical screening revealed the presence of tannins, flavonoids, carbohydrates, saponins, coumarins, fixed oil, and steroids across all cultivars, though alkaloids were notably absent. Proximate analysis demonstrated distinct compositional differences: Saidi seeds exhibited the highest protein (6.7%) and lowest moisture content (5.9%), whereas, Hamarai seeds recorded the lowest protein (5.5%) and highest moisture content (8.6%). Degla seeds displayed intermediate values (5.6% protein, and 7.4% moisture). All cultivars shared identical ash content. These findings underscore the potential of Libyan date palm seeds as sustainable sources of natural therapeutic agents and nutritional supplements.

Introduction

The date palm (*Phoenix dactylifera L.*) is a member of the family Arcecaceae, also known as Palmaceae. It is widely cultivated in the Middle East and North Africa and holds significant cultural, economic, and religious importance. As a vital crop, its fruits, known as dates, are consumed globally by millions of people. Dates are particularly cherished for their cultural and religious significance, especially during the holy month of Ramadan, when Muslims traditionally break their fasts with them. The date palm, therefore, not only serves as a source of sustenance but also as a symbol of heritage and faith [1, 2].

Date seeds, often considered a byproduct of date fruit consumption, have recently, getten the researcher's attention due to their potential phytoceuticals, and nutritional, and functional properties. Date seeds are particularly distinguished by their high concentration of phenolic compounds, flavonoids, and tannins [3-5]. These phytochemicals are responsible for their potent therapeutic application as antioxidant, antimicrobial, and anti-inflammatory [6, 7]. In addition to these bioactive compounds, date seeds contain other phytochemical constituents such as fatty acids (oleic, lauric, palmitic, myristic, linoleic, and stearic acids) [8, 9], sterols, saponins,

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

and alkaloids, which further amplify their therapeutic potential [7, 10]. Further, date seeds are rich in essential nutritional components, including proteins, lipids, and minerals such as potassium, magnesium, and calcium. This diverse nutritional profile positions date seeds as a promising candidate for functional food applications [11-13]. Proximate analysis serves as a critical parameter for assessing the nutritional quality and richness of date seeds. Their biochemical profile is further analyzed to explore the potential applications of these byproducts, which are otherwise regarded as agricultural waste. However, there remains a notable lack of data on date byproduct investigations, particularly, mainly cultivars grown in diverse Libyan oases. This study aims to address this gap by characterizing seeds from selected Libyan date varieties to evaluate their compositional and functional properties.

Materials and methods

Seeds collection: Samples of date (fruits) at the Tmar stage which were locally known as Saidi, Degla, Hamarai, were originally collected in October 2023 from Al-Wahat Jalo oases, in the Al Wahat district in northeastern Libya. The date was identified by the local farmers whose expertise in morphological classification is honed through generations of selective cultivation The dates were deseeded by removing the seeds and kept in a dry clean place.

Proximate analysis: One gram of each type of date seeds ground powder was weighed and dried at 105± 2.0°C for three hours to get the constant weight, cooled in a desiccator, and then weighed. The percentage loss in weight was expressed as the percentage of moisture content [14].

Protein content: The content was estimated by using the Kjeldahl method, where one gram (powered) of each date seed sample was digested with 25.0 ml of sulfuric acid. The mixture was distilled into a boric acid solution (4.0%, w/v), then titrated with a hydrochloric acid solution (0.25 N). About two grams (powdered) of each sample, placed in a porcelain container, was ignited and incinerated in a muffle furnace at 550°C for four hours, the residue was expressed as a percentage [15].

Phytochemical analysis: Dates samples (1.0 Kg of each type) were pitted to remove seeds, followed by sun-dried for one week during summer time then heated in an oven at 105ºC for three hours then roasted and ground into powder. The samples were subjected to extraction for phytochemical analysis using the specific test to identify the active constituent of each type of date seed sample in the current study [16, 17], and a methanolic extract was prepared to achieve the highest fixed oil content from the three seed cultivars.

Results and discussion

The date palm (*Phoenix dactylifera L.*) exhibits significant variation in its physical and chemical properties, influenced by geographical region, environmental conditions, and local climate. Libya, a vast nation with diverse climates, demonstrates this phenomenon distinctly. Along its Mediterranean coastline, characterized by mild, temperate weather, soft-textured dates are predominantly cultivated. In contrast, the central and southeastern oases, marked by harsher climates, yield semi-soft date varieties. Meanwhile, the hot, arid southern regions are renowned for producing dry Tamr, a firm, shelf-stable date type adapted to the extreme desert environment. This regional differentiation underscores how Libya's climatic diversity shapes the unique characteristics of its date palm cultivars [18, 19]. This study focused on three semi-soft date cultivars (Saidi, Degla, and Hamarai) cultivated in the Al-Wahat Jalo oasis region of Libya. Seed samples from these varieties underwent proximate analysis to evaluate their nutritional composition and physicochemical properties, **Table 1**. The findings of the current study,

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

indicate that date seeds account for approximately 7.0-14.0% of the total fruit weight. Among the evaluated cultivars, Saidi exhibited the highest average seed length (2.50±0.10 cm), followed by Degla (2.37±0.15 cm), though Degla displayed the smallest overall dimeters. In terms of weight, Saidi recorded the highest seed mass (1.70±0.208 gm), with Hamarai ranking second (0.82±0.140 gm) as shown in **Table 1**. These results highlight distinct physical variations between the semi-soft date cultivars studied. These results were similar to those recorded by Libyan study for the same cultivars [19].

Table 1: Physical characters of seeds which represent three cultivars grow in Al-Wahat Jalo oases

Date cultivars	Length cm	Diameter cm	Weight gm
Saidi	2.50±0.100	1.06±0.061	1.70±0.208
Degla	2.37±0.150	0.83±0.058	0.76±0.023
Hamarai	1.87±0.057	1.03±0.057	0.82±0.140

Proximate analysis of the three studied cultivars in **Table 2** revealed distinct differences in composition. Hamarai exhibited the highest moisture content (8.6±0.7%), followed by Degla (7.4±0.2%), with Saidi showing the lowest (5.9±0.1%). In contrast, Saidi demonstrated the highest protein content (6.7±0.3%), while Degla and Hamarai displayed nearly identical protein levels. Notably, all three cultivars shared comparable ash content (0.8±0.1%), indicating uniformity in mineral composition across the samples. Previous studies have suggested that variations in seed moisture content may correlate with climatic differences across the geographical origins of cultivars. However, in the current study, despite all samples being sourced from the same region, a difference in moisture content was observed, with the Saidi cultivar displaying the lowest levels compared to Hamarai and Degla. Notably, these findings of moisture, protein, and ash content still align with the moisture content ranges documented in earlier studies on Libyan date varieties [20, 21], and the same Moroccan, Emirates types [15, 22, 23] while based on moisture value, they slightly lower than Algerian types [24].

Table 2: Chemical composition of date seed cultivars

Date cultivars	Moisture content %	Protein %	Ash (%)
Saidi	5.9±0.1	6.7±0.3	0.8±0.1
Degla	7.4±0.2	5.6±0.2	0.8±0.2
Hemarai	8.6±0.7	5.5±0.2 %	0.8±0.1

Preliminary phytochemical screening of the seed samples revealed a rich profile of bioactive compounds with potential therapeutic relevance. All three cultivars (Saidi, Degla, and Hamarai) tested positive for steroids, tannins, saponins, coumarins, flavonoids, and carbohydrates, though alkaloids were absent in all samples **(Table 3**). Notably, methanolic extracts demonstrated variable fixed oil content across cultivars: detectable levels were observed in Degla and Hamarai, while Saidi exhibited a significantly higher concentration. These findings underscore the seeds' diverse phytochemical composition, which aligns with their potential applications in natural product development and pharmacological research. The phytochemical profiles of the analyzed date seed cultivars revealed consistent trends: all samples showed no detectable alkaloids but tested positive for tannins, flavonoids, carbohydrates, coumarins, and fixed oils [5, 11]. Notably, the three Libyan cultivars examined in this study Saidi, Hamarai, and Degla unexpectedly exhibited positive results for steroids. This finding aligns with reports from date seed studies in Indonesia and Nigeria, suggesting a potential cross-regional similarity in steroid occurrence despite differing climatic or geographical origins and positive alkaloid content [4, 25].

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ISSN: 2958-3101 print

Table 3: The findings of phytochemical screening of date seeds

Phytochemicals	Saidi	Degla	Hemarai
Steroid	+	+	+
Tannins	+	+	+
Fixed oil	+++*	+	+
Saponins	+	+	+
Coumarins	+	+	+
Flavonoids	+	+	+
Alkaloids	-	-	-
Carbohydrates	+	+	+

* An excessive amount of fixed oil was observed in the Saidi cultivar compared to the others

Conclusion: This study marks the comprehensive investigation into the phytochemical composition and proximate analysis of seeds from three date cultivars in Libya. The notable phytochemical and protein content observed in these seeds suggests their potential as valuable sources of natural therapeutic agents and nutritional supplements.

References

1. Jalal B, Hamid S, Alam M, Wani NN, Wani KR. Khajur (2024) Khajur (Phoenix dactylifera L.): Medicinal importance in perspective of Unani medicine and pharmacological studies. Journal of Drug Delivery and Therapeutics. 14 (11): 194-200. doi: 10.22270/jddt.v14i11.6860
2. Abdul-Sahib AZ, Abdul-Sahib IM (2020) A comparative study for some physical fruit characteristics, seed chemical composition of two date palm (Phoenix dactylifera L.) cultivars. Basrah Journal of Date Palm Research. 19 (2): 23-33. doi: Nil.
3. Hussain MI, Semreen MH, Shanableh A, Khattak MNK, Saadoun I, Ahmady IM, Mousa M, Darwish N, Radeef W, Soliman SSM (2019) Phenolic composition and antimicrobial activity of different Emirati date (Phoenix dactylifera L.) pits: A comparative study. Plants. 8 (11): 497. doi: 10.3390/plants8110497
4. Ekowati HW, Baroroh HN (2022) The phytochemical screening, total phenolic and photoprotective potential of date palm seeds (Phoenix dactylifera l .). International Journal of Scientific Research Updates. 04 (01): 143-149. doi:10.53430/ijsru.2022.4.1.0096
5. Labyad N, Doro B, Gafri F, Elamaari S, Almusrati N (2020) 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. 22 (1): 168-175. doi: 10.52155/IJPSAT.V22.1.2017
6. Bentrad N, Gaceb-Terrak R (2020) Evaluation of the level of biomolecules isolated from date palm seeds (Phoenix dactylifera) and in vitro antioxidant property. Biomedicine. 10 (2): 23-29. doi: 10.37796/2211-8039
7. Alkhooi MA, Kong M, Aljaafari MN, Abushelaibi A, Erin Lim SH, Cheng WH, Chong CM, Lai KS. (2022) Biochemical composition and biological activities of date palm (Phoenix dactylifera L.) seeds: A review. Biomolecules. 12 (11): 1-14. 1626. doi: 10.3390/biom12111626
8. Dehdivan NS, Panahi B (2017) Physicochemical properties of seeds and seeds oil extracted from Iranian date palm cultivars. Biological Forum - An International Journal. 9 (1): 139-144. doi: Nil.
9. Akbari M, Razavizadeh R, Mohebbi GH, Barmak A (2012) Oil characteristics and fatty acid profile of seeds from three varieties of date palm (Phoenix dactylifera) cultivars in Bushehr-Iran. African Journal of Biotechnology. 11 (57): 12088-12093. doi: 10.5897/AJB12.1084
10. Nwaokobia K, Ogboru RO, Idibie CA (2018) Investigating the proximate, ultimate and chemical composition of four cultivars of date seed , Phoenix dactylifera L. World News of Natural Sciences. 18 (2): 52-61. doi: Nil.
11. Himanshu NK, Khangwal I, Upadhyay A (2024) Assessment of nutritional composition, phytochemical screening, antioxidant, and antibacterial activities of date palm (Phoenix dactylifera) seeds. Discover Food. 4 (1): 151. doi: 10.1007/s44187-024-00234-0

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

12. Bouaziz MA, Bchir B, Ben Salah T, Mokni A, Ben Halima H, Smaoui S, Attia H, Beshes S (2020) Use of endemic date palm (Phoenix dactylifera L.) seeds as an insoluble dietary fiber: Effect on Turkey meat quality. Journal of Food Quality. 12 (11): 1-14. Article ID 8889272. doi: 10.1155/2020/8889272
13. Dhaouadi K, Ammar H, Khouja M, Sebei H, lopez S (2019) Chemical composition and antioxidant activity of date seeds from different Tunisian date palm cultivars. Journal of Food Science and Engineering. 9 (4): 123-30. doi: 10.17265/2159-5828/2019.04.001
14. AOAC (1990) Official methods of analysis. In: Association of Official Analytical Chemist. 14th ed., 503-515. Arlngton, USA. ISBN: 0-9355884-42-0.
15. Golshan TA, Solaimani DN, Yasini SA (2017) Physicochemical properties and applications of date seed and its oil. International Food Research Journal. 24 (4): 1399-406. doi: Nil.
16. Settaluri VS, Al Anbari TM, Al Shukaili KS, Rawahi RM, Azmi SN, Hejaz S, Pankaj R, Salla H, Ahmed QU, Hussain SA, Daddam JR, Sah S, Mahmood S (2024) Phytochemical screening and in vitro evaluation of antioxidant and antimicrobial efficacies of Pteropyum scoparium (Jaub. & Spach) crude extracts. Journal of King Saud University-Science. 36 (1): 102995, 1-11. doi: 10.1016/j.jksus.2023.102995
17. Madike LN, Takaidza S, Pillay M (2017) Preliminary phytochemical screening of crude extracts from the leaves, stems, and roots of Tulbaghia violacea. International Journal of Pharmacognosy and Phytochemical Research. 9 (10): 1300-1308. doi: 10.25258/phyto.v9i10.10453
18. Racchi ML, Camussi A (2018) The date palms of Al Jufrah-Libya: A survey on genetic diversity of local varieties. The Journal of Agricutlure and Environment for International Development. 112 (1): 161-184. doi: 10.12895/jaeid.20181.776
19. El Alwani AM, El- Ammari SS (2015) Fruit physical characteristics of date palm cultivars grown in three Libyan oases. Faculty of Sciences, University of Garyounis. 6: 662-670. Conference: 2nd International Conference on Date Palms, Al-Ain, United Arab Emirates. doi: Nil.
20. Hribesh SO, Eshkourfu RO, Al-Tunsi NAM, Eddeif SA, Al-Jenkawi AS, Laswad NA (2019) Determination of some chemical composition of four date seeds from AL-Khums Libya. International Journal of Engineering Research and Technology. 8 (12): 714-716. doi: 10.17577/IJERTV8IS120326
21. Swedan A, Auzi AA, Lahmer RA (2021) Antioxidant-antibacterial properties and chemical composition of Bekrari and Bronci Libyan date palm fruits. Libyan Journal of Agriculture. 26 (2): 15-33. doi: Nil.
22. Bouhlali E T, Alem C, Ennassir J, et al (2017) Phytochemical compositions and antioxidant capacity of three date (Phoenix dactylifera L.) seeds varieties grown in the South East Morocco. Journal of the Saudi Society of Agriculture Sciences. 16 (4): 350-357. doi: 10.1016/j.jssas.2015.11.002
23. Ahfaiter H, Zeitoun A (2018) Physicochemical properties and nutritional value of Egyptian date seeds and its applications in some bakery products. Journal of the Advances in Agricultural Research. 23 (2): 260-279. doi: Nil.
24. Yaiche HA, Sidi AM, Saadi SA, Bouras N, Khali M (2022) Chemical characterization of date seeds (Phoenix dactylifera L.) cultivated in Algeria for its application as functional ingredients. Acta Universitatis Cibiniensis Series E Food Technology. 26 (2): 147-156. doi: 10.2478/aucft-2022-0012
25. Eze-Steven P, Onyishi CK, Mamah EE (2021) Qualitative and quantitative phytochemical analysis of aqueous extract of Phoenix dactylifera L. seed (Date Seed). IAA Journal of Scientific Research. 7 (1): 11-16. doi: Nil.

Acknowledgments: The authors extend their gratitude to the Food and Drug Control Center for their invaluable support and express their sincere appreciation to the local community of Al Wahat for their generous assistance.
Author contribution: NSL conceived and designed the study. AAA, BKA & RKA collected the data. NSL performed data analysis, and drafted and revised the manuscript for important intellectual context. All the 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 completely 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.