



E-ISSN: 2709-9385  
P-ISSN: 2709-9377  
JCRFS 2024; 5(1): 170-172  
© 2024 JCRFS  
[www.foodresearchjournal.com](http://www.foodresearchjournal.com)  
Received: 09-03-2024  
Accepted: 15-04-2024

**Nikhat Khatun Durrani**  
Student, M.Tech, Department  
of Agricultural Engineering,  
Maharashtra Institute of  
Technology, Aurangabad,  
Maharashtra, India

**Dr. DT Bornare**  
Ph.D. Scholar, Associate  
Professor and HOD,  
Department of Agricultural  
Engineering Maharashtra  
Institute of Technology,  
Aurangabad, Maharashtra,  
India

**Dr. SG Jaiswal**  
Ph.D. Scholar, Assistant  
Professor, Department of  
Agricultural Engineering,  
Maharashtra Institute of  
Technology, Aurangabad,  
Aurangabad, Maharashtra,  
India

**Correspondence Author;**  
**Nikhat khatun Durrani**  
Student, M.Tech, Department  
of Agricultural Engineering,  
Maharashtra Institute of  
Technology, Aurangabad,  
Maharashtra, India

## Reducing caffeine content in coffee by incorporating date stone coffee and cinnamon: A review

Nikhat Khatun Durrani, Dr. DT Bornare and Dr. SG Jaiswal

DOI: <https://doi.org/10.22271/foodsci.2024.v5.i1c.143>

### Abstract

Human societies have long relied on medicinal plants for health and wellness, with date seeds from *Phoenix dactylifera* L. emerging as a promising natural resource. This review consolidates existing literature on the nutritional composition and health benefits of date seeds, exploring their potential as functional food ingredients and sustainable alternatives within the date industry. Rich in essential nutrients such as dietary fiber, protein, carbohydrates, minerals, phenolics, and antioxidants, date seeds exhibit therapeutic properties for managing conditions like obesity, diabetes, and cholesterol issues. Innovative applications, including date seed coffee and its derivatives, offer healthier alternatives to traditional caffeinated beverages. Sustainable management practices for date by-products are crucial for optimizing resource utilization and minimizing environmental impact. Additionally, integrating cinnamon with date-based products presents opportunities for synergistic health benefits. Overall, date seeds serve as a valuable source of bioactive compounds with diverse applications in functional foods, supporting human health and sustainable development goals.

**Keywords:** Coffee, date stones, reduction of caffeine, cinnamon, incorporation, health benefits, bioactive compounds, functional foods

### 1. Introduction

#### 1.1 Utilization of Medicinal Plants in Human Societies

Throughout human history, the use of medicinal plants has been a cornerstone of healthcare practices globally. From ancient civilizations to modern times, societies have relied on the therapeutic properties of plants to treat and prevent various ailments. This enduring interest in herbal medicine underscores the profound connection between nature and human well-being (Kiani *et al.*, 2018) <sup>[1]</sup>.

#### 1.2 Emergence of Date Seeds as a Natural Resource

Within this context, date seeds derived from *Phoenix dactylifera* L. have emerged as a promising natural resource. Date palms, known for their sweet fruit, also yield date seeds, which constitute approximately 10-13% of the dry weight of the fruit (Tang *et al.*, 2013) <sup>[4]</sup>. Over the years, research has unveiled the nutritional composition and health benefits of date seeds, shedding light on their potential as functional food ingredients and sustainable alternatives within the date industry.

#### 1.3 Nutritional Composition and Health Benefits of Date Seeds

Date seeds are rich in essential nutrients, including dietary fiber, protein, carbohydrates, and minerals, alongside bioactive compounds such as phenolics and antioxidants (Al-Farsi and Lee, 2008a) <sup>[4]</sup>. Studies have highlighted the therapeutic properties of date seeds in managing conditions like obesity, diabetes, and cholesterol issues. Additionally, innovative applications like date seed coffee and its derivatives offer healthier alternatives to traditional caffeinated beverages, aligning with the growing demand for functional foods (Abdillah and Andriani, 2012) <sup>[1]</sup>.

#### 1.4 Importance of Sustainable Management Practices

Furthermore, sustainable management practices for date by-products are crucial to optimize resource utilization and minimize environmental impact. Despite their nutritional richness, date seeds are often discarded as waste, presenting an opportunity for more sustainable utilization within the date industry. Leveraging date seeds as raw materials for beneficial

food ingredients can contribute to both economic prosperity and environmental conservation (Al-Farsi and Lee, 2011)<sup>[3]</sup>.

### 1.5 Integration of Medicinal Plants: Cinnamon

Moreover, the integration of other medicinal plants like cinnamon with date-based products presents opportunities for synergistic health benefits. Cinnamon, renowned for its aromatic flavor and therapeutic properties, offers antioxidant, anti-inflammatory, and antimicrobial benefits (Pallavi Kawatra *et al.*, 2015)<sup>[10]</sup>. Exploring the combined use of date seeds and cinnamon in functional foods can enhance nutritional profiles and promote overall well-being.

### 1.6 Conclusion

In summary, date seeds represent a valuable natural resource with diverse applications in functional foods, supporting both human health and sustainable development goals. By harnessing the nutritional and therapeutic potential of date seeds and integrating them into innovative products, we can pave the way for healthier dietary choices and environmental sustainability.

## 2. Review of literature

According to Al Farsi *et al.* (2005)<sup>[2]</sup> Date seeds are characterized by a lower content of soluble fibers relative to their dominant insoluble fiber fraction. Potassium is the principal mineral, making up 0.5% of the seeds' composition, with other minerals present in moderate amounts. Additionally, trace elements such as aluminum, lead, cadmium, chloride, and sulfur have been detected in some date seeds.

Geetha *et al.* (2014)<sup>[8]</sup> Date seeds are rich in essential minerals such as potassium, magnesium, calcium, phosphorus, sodium, and iron. Notably, potassium is found in significant amounts, with a concentration of 3790 mg/kg. Potassium is crucial as an electrolyte and is closely associated with sodium metabolism, helping to regulate heartbeat. Its deficiency can lead to various health issues. Furthermore, date seeds contain numerous bioactive compounds with therapeutic properties that can combat various diseases.

As noted by Al-Farsi *et al.* (2007)<sup>[6]</sup> Compositional analysis reveals that date seeds contain 10.20% moisture, 1.18% ash, 10.36% protein, and 72.59% carbohydrates, including oil. The primary components—carbohydrates, protein, and oil—play vital roles in seed germination. Additionally, date seeds are notably high in dietary fiber, with approximately 80% in coarsely milled seeds and 71% in finely milled seeds. This high fiber content makes date seeds advantageous for addressing conditions such as obesity, diabetes, cholesterol issues, and intestinal problems.

As reported by Al-Farsi and Lee (2008)<sup>[4]</sup> The phytochemical composition of date seeds includes flavonoids, phenolic acids, sterols, and tocopherols. Hesperidin is a key flavonoid, found at a concentration of 17.27 mg/100 g, and provides various health benefits such as cancer prevention, inhibition of atherosclerosis, and protection against bone loss. The phenolic acids in date seeds include protocatechuic, hydroxybenzoic, coumaric, ferulic, and caffeic acids.

Abdillah and Andriani (2012)<sup>[1]</sup> introduced an innovative, economical, and healthier alternative to traditional coffee with Turkish caffeine-free coffee, which boasts a unique flavor. This special coffee blend, made from date seeds,

aims to offer consumers a flavorful and health-conscious choice. Additionally, date seeds were used in creating 'Cappuccino Choco Float,' where they were mixed with chocolate. These date seeds are rich in minerals and natural antioxidants, helping to meet daily dietary requirements. The main goal of this study was to evaluate the nutrient content, phytochemical properties, and emulsification capabilities of date seed powder. Moreover, the date seed powder was used as a substitute for Nescafe in cappuccino and latte drinks, followed by an assessment of their sensory properties.

The investigation led by J.S. Hamada *et al.* aimed to evaluate the high-value components within date pits for their potential use in functional foods. The primary objectives were to conduct a preliminary analysis of date pits from three major varieties in the UAE and to identify possible applications in the food industry. Date pits were found to have no noticeable odor and exhibited colors ranging from light to dark brown. They had a bland taste with slight bitterness. Their composition included 7.1-10.3% moisture, 5.0-6.3% protein, 9.9-13.5% fat, 46-51% acid detergent fiber, 65-69% neutral detergent fiber, and 1.0-1.8% ash. More than half of the pit protein was difficult to extract using sequential methods involving NaCl, ethanol, and acetic acid. The pits also contained a substantial amount of oil, which requires further characterization for its components, biological activities, and stability. Additionally, the pits were rich in fiber and potentially resistant starch, indicating possible health benefits. Further research is essential to isolate and characterize bioactive constituents with antimicrobial, antioxidant, and other health-promoting properties. This study was conducted by J.S. Hamada *et al.* in (2001)<sup>[15]</sup>.

Maha Al-Khalili *et al.* (2023)<sup>[7]</sup> explored the applications of date pits in enhancing the functionality and quality of food products. Agro-byproducts from the bioprocessing industry, such as date pits, hold significant potential for functional and bioactive applications in foods, health supplements, and bio-composites. Abundantly generated as by-products in date processing factories, date pits are a rich source of bioactive compounds. Incorporating date pits and their processed fractions into food products is an economical strategy to improve their nutritional profile, adding fibers, proteins, fats, vitamins, minerals, polyphenols, and antioxidants. Besides these nutritional benefits, date pits offer versatility and cost-effectiveness in various food applications. They can function as natural preservatives, fat replacers, tenderizing agents, hydrocolloids, and emulsifying agents. The diverse uses of date pits make them a valuable ingredient in the creation of functional and innovative food products.

Rooba Nandhini *et al.* (2022)<sup>[12]</sup> conducted a study focusing on the formulation, standardization, proximate composition, and shelf life analysis of palm date seeds (*Phoenix dactylifera*) coffee powder. Sensory evaluations revealed that Variation III received higher mean scores, indicating increased acceptability among participants. Nutritional analysis confirmed the product's caffeine-free nature and identified essential nutrients such as carbohydrates, energy, proteins, fats, phenols, tryptophan, and caffeine. Notably, the product demonstrated a favorable shelf life of approximately 11 months from the manufacturing date. In summary, the use of date seeds presents a health-conscious alternative to traditional coffee, providing a caffeine-free

option. Date seed coffee offers a nutrient-rich beverage suitable for regular consumption, making it a healthy choice for daily coffee drinkers.

Joerg gruenwald *et al.* (2010) <sup>[9]</sup> discussed the health benefits of cinnamon, which has been historically utilized both as a spice and in traditional herbal medicine, attracting attention for its wide-ranging potential advantages for health. *In vitro* and animal studies suggest that cinnamon possesses various properties, including anti-inflammatory, antimicrobial, antioxidant, antitumor, cardiovascular, cholesterol-lowering, and immunomodulatory effects. Particularly noteworthy are findings from *in vitro* investigations suggesting that cinnamon may mimic insulin, thereby enhancing insulin activity or promoting cellular glucose metabolism. Animal studies have further emphasized its significant hypoglycemic effects. However, it is important to acknowledge the limited number of well-controlled clinical trials, which impedes definitive conclusions regarding the actual health benefits of cinnamon for free-living humans. Among the promising areas of research, cinnamon's potential role as a complementary treatment for type 2 diabetes mellitus is notable. Nonetheless, further research is necessary to establish recommendations and gain a comprehensive understanding of the potential health benefits associated with cinnamon consumption.

Areeb Qasim *et al.* (2023) <sup>[13]</sup> investigated the utilization of date pulp and pit powder in creating decaffeinated coffee as a healthier alternative to traditional beverages. With health-conscious consumers increasingly seeking alternatives due to concerns about the potential risks associated with coffee consumption, such as its chlorogenic acid (CGA) and caffeine content, there is a rising demand for a coffee substitute that maintains the taste profile of coffee while addressing these concerns. This study aims to analyze the compositional profile of a coffee alternative made from date seeds and pomace powder, focusing on its potential benefits for neurological health. The process involved roasting date seeds at 200 °C for 20 minutes and combining them with date pomace, milk powder, and coconut to enhance flavor, resulting in an instant coffee powder. Proximate analysis was conducted to determine the percentages of moisture, ash, crude fat, crude protein, crude fiber, and non-fiber carbohydrates (NFE) in the coffee powder. The developed coffee powders demonstrated significant fiber content, low fat levels, reduced protein content, and comparable moisture and ash percentages to *Coffea arabica* powder (the control), while containing negligible amounts of caffeine.

### 3. References

1. Abdillah LA, Andriani M. Friendly alternative healthy drinks through the use of date seeds as coffee powder. In: Proceeding of International Conference on Economics, Business and Management (ICEBM) Indonesia; c2012. p. 80-7.
2. Al-Farsi A, Alasalvar C, Al-Abid M, Al-Shoaily K, AlAmry M, Al-Rawahy F, *et al.* Compositional and functional characteristics of dates, syrups, and their byproducts. *Journal of Agricultural and Food Chemistry*. 2005;53(19):7586-7591.
3. Al-Farsi M, Lee C. Usage of Date (*Phoenix dactylifera* L.) Seeds in Human Health and Animal Feed. In: *Nuts and Seeds in Health and Disease Prevention*; c2011. p. 447-452.
4. Al-Farsi MA, Lee CY. Nutritional and functional properties of dates: A review. *Critical Reviews in Food Science and Nutrition*. 2008;48(10):877-887.
5. Al-Farsi MA, Lee CY. Optimization of phenolics and dietary fibre extraction from date seeds. *Food Chemistry*. 2008;108:977-985.
6. Al-Farsi M, Alasalvar C, Al-Abid M, Al-Shoaily K, AlAmry M, Al-Rawahy F, *et al.* Compositional and functional characteristics of dates, syrups, and their byproducts. *Food Chemistry*. 2007;104:943-947.
7. Al-Mamari A, Al-Habsi N, Al-Khalili M, Rahman M. Extraction and characterization of residue fibers from defatted date-pits after alkaline-acid digestion: Effects of different pretreatments. *Journal of Thermal Analysis and Calorimetry*; c2022.
8. Geetha T, Geetha N. Phytochemical screening, quantitative analysis of primary and secondary metabolites of *Cymbopogon citratus* (DC) Stapf leaves from Kodaikanal hills, Tamilnadu. *International Journal of Pharmaceutical Technology Research*. 2014;6:521-529.
9. Gruenwald J, Freder J, Armbruester N. Cinnamon and health. *Critical Reviews in Food Science and Nutrition*. 2010;50(9):822-834.  
<https://doi.org/10.1080/10408390902773052>
10. Kawatra P, Rajagopalan R. Cinnamon: Mystic powers of a minute ingredient. *Pharmacognosy Research*, 2015, 7(1). <https://doi.org/10.4103/0974-8490.157990>
11. Kiani AA, Ezatpour B, Niazi M, Jahanbakhsh S. Toxicity effect of *Nectaroscordum tripedale* extract on hematological and biochemical parameters in mice. *Entomology and Applied Science Letters*. 2018;5(2):22-25.
12. Nandhini K, Sathiya Dr. Formulation, standardisation, proximate composition and shelf life analysis of palm date seeds (*Phoenix dactylifera*) coffee powder. *International Journal of Home Science*. 2022;8:27-31.  
<https://doi.org/10.22271/23957476.2022.v8.i3a.1347>
13. Qasim A, Nazir A, Itrat N, Khalid I, Virk T, Khan M, *et al.* Utilization of date pulp and pit powder to make decaf coffee to improve cognitive health. *Journal of Plant and Environment*. 2023;5:37-50.  
<https://doi.org/10.33687/jpe.005.01.4418>
14. Tang ZX, Shi LE, Aleid SM. Date fruit: Chemical composition, nutritional and medicinal values, products. *Journal of the Science of Food and Agriculture*. 2013;93:2351-2361.
15. Hamada S, Sutou S, Morita T, Wakata A, Asanami S, Hosoya S, *et al.* Evaluation of the rodent micronucleus assay by a 28-day treatment protocol: Summary of the 13<sup>th</sup> Collaborative Study by the Collaborative Study Group for the Micronucleus Test (CSGMT)/Environmental Mutagen Society of Japan (JEMS)-Mammalian Mutagenicity Study Group (MMS). *Environmental and molecular mutagenesis*. 2001;37(2):93-110.