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COMPARATIVE ANALYSIS OF DECAFFEINATED DATE SEEDS COFFEE AND CAFFEINATED COFFEE

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ABSTRACT

The study presents a comparative analysis of decaffeinated date seed coffee and caffeinated coffee seed coffee, focusing on their chemical composition, antioxidant properties, and potential health benefits. The research investigates the mineral profile, including protein and fat content, antioxidant activity, and key micronutrients present in both seeds. The study aims to highlight the potential of decaffeinated date seeds as a caffeine-free alternative to traditional coffee, considering factors such as taste, aroma, and consumer acceptance. Research reveals that decaffeinated date seeds have antioxidant advantages and a distinct nutritional composition, while caffeinated coffee seeds have a higher caffeine concentration and distinct flavor profiles with negative health concerns. This comparative analysis provides insights into the viability of utilizing date seeds as a functional ingredient in food and beverage industries, promoting sustainable and innovative uses of agricultural by-products and helping individuals to overcome the effects caused by caffeinated coffee consumption.

INTRODUCTION

Caffeine, a stimulant and psychoactive beverage that is consumed regularly, has an impact on human behaviour and physiological health Caffeine competitively antagonizes the adenosine receptors (ARs), which are G protein-coupled receptors largely distributed in the human body, including the heart, vessels, brain, and kidneys. Date palm (***Phoenix dactylifera L.***) is a vital crop tree consumed in many Middle Eastern countries. Despite their tiny sizes, date seeds are loaded with powerful nutrients and antioxidants such as B vitamins, dietary fiber,

vitamin K, calcium, phosphorus, phenolic compounds, and flavonoids. Here are some of the health benefits that one can get from consuming date seeds:

1. Beneficial for inflammation

Chronic inflammation can affect overall well-being because it is widely linked to the cause of many serious health issues such as tissue damage, heart diseases, cancer, diabetes, and autoimmune disorders.[1] Date seeds, however, have anti-inflammatory properties that can help reduce the effects of inflammation.

Eating date seeds has several health advantages, including the presence of strong substances such as phenolic acids and saponins that can lessen the symptoms of inflammation. Date seeds can help lower the risk of several diseases by lessening the impact of inflammation.

2. Digestive Health and Weight management

Fiber is important in maintaining, as it plays an important role in improving the regularity and bulkiness of bowel movements. As a result, the body is at a lower risk of experiencing constipation. Date seeds contain good amounts of dietary fiber that can enhance the digestive system. The fiber content in date seeds can additionally aid the health of the gut microbiome. The gut microbiome, which exists in the gut, helps in the digestion process of foods like complex carbohydrates.[2] Through the functions of the gut microbe, the cells in the colon lining are able to get energy and this contributes to better gut health.

3. Regulation of blood sugar

Date seeds may help control blood sugar levels, according to some research. This is due to the fact that they contain substances that help improve insulin sensitivity, such as fiber, phenolic acids, polyphenols, and magnesium. The body's cells are now better able to react to insulin, which helps control blood sugar levels. Date seeds may increase insulin sensitivity and lower the incidence of hyperglycemia.[1]

4. Support for the immune system

Since the immune system is in charge of warding off infections, illnesses, and dangerous organisms, it is a vital and essential component of the body. Consuming appropriate nutrients that can improve immune system functions is crucial for general health. Eating date seeds has several health advantages, one of which is immune system support.[3] Numerous vitamins and minerals, including zinc, vitamin C, and vitamin A, are found in date seeds and are effective in boosting immunity.

The immune system's growth and cellular immunological responses are significantly aided by zinc and vitamin A. Additionally; zinc can be very important for enhancing the immune system's signalling pathways. The body's reaction to infections may be impacted by a zinc shortage. By boosting immune cell activity, vitamin K can aid in better immune cell function, these minerals can shield tissues and cells from oxidative harm. Oxidative damage raises the risk of a number of diseases and can interfere with immune system processes.

5. Support for bone health

Another benefit of date seeds is to maintain bone health. These tiny jewels contain bone-supporting nutrients such as magnesium, calcium, vitamin K, and phosphorus. Calcium, which is a major nutrient for bone development, helps to provide structure and strength to bones. It is important for maintaining bone density and preventing diseases like osteoporosis.

Phosphorus and magnesium support the control of calcium absorption, which increases bone metabolism. Additionally, vitamin K promotes bone mineralization and strength. In the long run, eating date seeds can assist stronger bones as well as improve bone density and integrity. Furthermore, the antioxidants in date seeds can protect bone tissues from oxidative damage, which lowers the risk of bone loss and the onset of age-related bone illnesses.

A coffee-like beverage made from date seeds and a comparison between coffee made from decaffeinated date seeds and coffee made from caffeinated coffee beans. It has been demonstrated that date seed coffee has a far higher nutritional value and is rich in proteins, minerals, and antioxidants.

Aims of the study are

1. Extraction of caffeine
2. Estimation of protein
3. Extraction of lipids
4. Estimation of antioxidant capacity
5. Estimation of minerals

- Estimation of Sodium and Potassium by flame photometer.
- Estimation of phosphorus
- Estimation of copper by isoamyl alcohol
- Estimation of calcium

LITERATURE REVIEW

For individuals from arid and semiarid parts of the world, growing date palms (*Phoenix dactylifera L.*) is their primary occupation and source of income.[4] The aim of this study was to make a coffee-like beverage from date seeds and study a comparative analysis of decaffeinated date seeds coffee and caffeinated coffee beans coffee. Date seed coffee was shown to have significantly higher nutritional value and to be high in minerals, proteins, and antioxidants.

Nutritional value

1. Rich in fiber (8-10%), protein (5-7%), and healthy fats (10-15%).
2. Good source of minerals: potassium, magnesium, copper, and zinc.
3. Contain antioxidants, flavonoids and phenolic acids.

Pharmacological properties

1. Antioxidant and anti-inflammatory activities.
2. Hypoglycemic and antidiabetic effects.
3. Cardiovascular protection through lipid profile improvement.
4. Neuroprotective effects against Alzheimer's and Parkinson's diseases.[5]

Therapeutic applications

1. Traditional medicine: digestive issues, respiratory problems, and skin conditions.
2. Modern medicine: antiviral, antibacterial, and antifungal properties.[6]

Coffee and Beverage applications

1. Date seed coffee: Rich in antioxidants, may improve cognitive function, rich in protein, minerals, carbohydrates and lipids.
2. Date seed tea: Potential health benefits, including weight loss and digestion.

Food industry applications

1. Value-added products: date seed flour, oil, and protein powder.
2. Functional foods: bakery products, snacks, and energy bars.

METHODOLOGY

Extraction of caffeine: Date Seed Powder and Coffee Beans Powder were kept boiling for 20 minutes, further addition of sodium carbonate to convert the tannins into water soluble salts and then mixed with Dichloromethane (DCM) in a separating funnel for extracting

caffeine from sample.

Estimation of protein by folin lowry method: The Folin-Ciocalteu reagent reacts with proteins under alkaline conditions to form a complex. It is done by reducing the Folin-Ciocalteu reagent prematurely or by interfering with color development, The absorbance of the blue complex formed by the standard solutions is measured at a specific wavelength.

Extraction of Fats and Oils: n-Hexane was added to Date Seed Powder and Coffee Seed Powder in an evaporating dish and constant washings were provided at the interval of 5 to 7 minutes and then kept in a water bath for oil content. Thin Layer Chromatography was performed by spotting the sample with a mixture of solvent and observed under UV-Spectrometer.

Antioxidant activity: The DPPH (2,2-diphenyl-1-picrylhydrazyl) assay is a simple, common method for measuring the antioxidant capacity of a compound, extract, or food. The assay measures how well an antioxidant reduces the DPPH radical by transferring hydrogen.

Mineral profile: Ash method was used for this estimation, samples were completely incinerated and ash solution was made for further detection.

1. **Estimation of Sodium and Potassium by flamephotometer:** Particular Filters were added for estimating Sodium and Potassium in the samples.

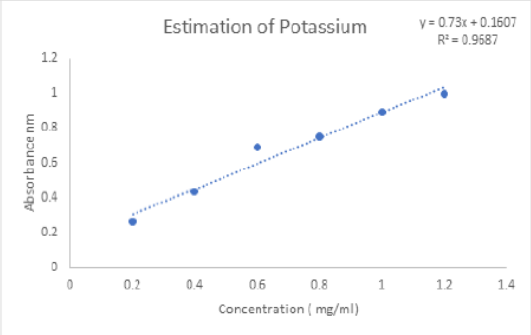
2. **Estimation of copper by isoamyl alcohol method:** Isoamyl alcohol method for estimating copper, adding isoamyl alcohol to a copper solution, separating the organic phase, and measuring its absorbance.

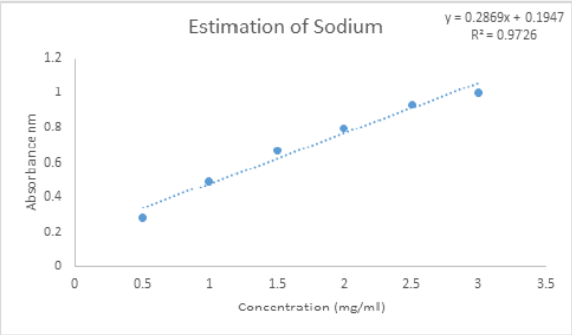
3. **Estimation of Phosphorus by Fiske-Subbarow Method:** The phospho-molybdate then reacts with amino-naphthol-sulfonic acid, (ANSA) resulting in the formation of a molybdenum complex that gives rise to a blue-colored solution.

4. **Estimation of calcium:** A titration method that uses ethylenediaminetetraacetic acid (EDTA) to determine the amount of calcium in the sample.

RESULTS

	Decaffeinated Date Seeds Coffee	Caffeinated Coffee Powder
Caffeine content	-	0.83g/10g
Lipid content	0.585g/10g	0.111g/10g
Protein content	0.1g/10g	0.002g/10g
Antioxidant capacity	8.8% for 10g	-
Mineral estimation	Phosphorus: 0.16mgs Calcium : 80.16mgs Copper: 0.44mgs	-





DISCUSSION AND CONCLUSION

The study demonstrates that decaffeinated date seed coffee is a nutritionally rich alternative to caffeinated coffee. It offers a higher concentration of proteins, lipids, and essential minerals, without the stimulating effects of caffeine. The date seed coffee also exhibited greater antioxidant capacity, making it beneficial for reducing oxidative stress and supporting cardiovascular, digestive, and bone health. These findings suggest that decaffeinated date seed coffee could serve as a health-promoting beverage with various potential therapeutic applications.

Future studies can be carried out on analysing more bioactive compounds as well as essential minerals in the date seed coffee. This will help in product development of the date seed coffee on which clinical studies can be carried out to validate the health advantages before bringing it into the market.

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