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DIVERSIFICATION OF *Phoenix dactylifera fructus* L. SEEDS BASED ON ORGANOLEPTIC CHARACTERISTICS OF *Felium* CONTENT IN POLYPHENOLIC, VOLATILE AND PHENOLIC COMPOUNDS AS AN ALTERNATIVE TO DECAFFEINATED COFFEE BEVERAGES

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Abstrak

As an effort to produce coffee that is loved by people all over the world, it has become one of the strategies to increase coffee consumption. The coffee in question is made from Phoenix dactylifera fructus L. beans, which is a rare and alternative drink that reduces caffeine levels. Alternatives in reducing or caffeine-free drinks are one of the best ways to improve human health. This coffee beverage, derived from the seeds of Phoenix dactylifera fructus L., is rich in benefits, including antioxidants, fibre, and minerals such as potassium and magnesium, making it highly suitable for heart health and blood pressure regulation. Coffee made from Phoenix dactylifera fructus L. beans is a delicious beverage due to its caramel flavour. It is also safe for people with stomach problems because it does not contain acid. Phoenix dactylifera fructus L. coffee is a favourite beverage because it contains phenolic compounds, volatiles, polyphenols, flavonoids, vitamin E, and carotenoids that can fight free radicals. In addition, Phoenix dactylifera fructus L. coffee, which is an alternative caffeine-free beverage, can help manage diabetes and reduce inflammation.

INTRODUCTION

Dates, also known as sweet fruit with the Latin name *Phoenix dactylifera fructus* L., are fruits that are high in iron and potassium, which are essential for the formation of red blood cells and bone marrow. In addition, they contain potassium and vitamin C (Asnawi et al., 2022).

Dates are a type of palm tree that grows in South Africa and Saudi Arabia. Dates are very

sweet fruits and, from an economic perspective, dates, or *Phoenix dactylifera fructus* L., can develop as a link in the date cultivation chain (Rahmadani et al., 2017).

According to Asnawi et al. (2022), dates are widely consumed by the general public. Dates, or *Phoenix dactylifera fructus* L., are high in iron and calcium, which are essential for the formation of red blood cells and bone marrow. In addition, *Phoenix dactylifera fructus* L. contains potassium and vitamins.

The date fruit, more commonly known as *Phoenix dactylifera fructus* L., is utilised for its seeds. The seeds of *Phoenix dactylifera fructus* L. are processed into a date product, namely the utilisation of *Phoenix dactylifera fructus* L. seeds into a beverage that is beneficial for health. However, among the general public, not many people are aware of its benefits and nutritional content (Badan Pangan Lokal dan Gizi, 2022).

Basically, the general public ignores and discards *Phoenix dactylifera fructus* L. seeds. This is because they are considered waste and are not useful or processable (Local Food and Nutrition Agency, 2022). However, in fact, the seeds of *Phoenix dactylifera fructus* L. are rich in nutrients, including iron, calcium, vitamin C, protein, polyphenolic compounds, and flavonoids. They also do not contain caffeine, which acts as an antioxidant due to their phenolic content that can reduce free radicals (Indartuti & Maduwinarti, 2021).

Coffee beverages made from *Phoenix dactylifera fructus* L. beans can be served at any time and interval, whereby the serving and consumption time of decaffeinated coffee made from *Phoenix dactylifera fructus* L. beans has a change in content that can affect health. According to Trissanthi & Susanto (2016), the content found in *Phoenix dactylifera fructus* L. beans used to make decaffeinated coffee will decrease, and this decrease is in the content that can reduce free radicals.

Based on research by Gianing & Eliska (2023), the results of organoleptic analysis based on colour testing, aroma testing, texture testing, taste testing, and Fe (*Felium*) content testing show that decaffeinated coffee from *Phoenix dactylifera fructus* L. beans is acceptable to the public and that the formulation is successful.

According to Yusriani et al. (2018) in Nawirah et al. (2021), date seeds (*Phoenix dactylifera fructus* L.) contain 71.9-73.4% carbohydrates, 5-6.3% protein, and 9.9-13.5% fat. In addition, they contain 9.0–9.100 g^{-1} of oil, which can be used as an ingredient in food, cosmetics, and pharmaceuticals.

RESEARCH METHODS

Research Location

This experimental research was conducted at the Integrated Laboratory of the University of Sumatera Utara (USU) in Medan, North Sumatra. The experimental research was conducted over a period of three months, from January 2025 to April 2025. The subjects of this experimental research were 28 students and members of the community.

Research Design

This study was an experimental study using a completely randomised design (CRD) consisting of three treatments and three replicates, resulting in nine trials.

Observation Variables

Data analysis was followed by experimental data from research indicators including testing of colour, aroma, texture, taste and iron (Fe) content. The data analysis used was ANOVA (*Analysis of Variance*) at a 5% level.

RESULTS AND DISCUSSION

The results of the research conducted over a period of three months, which examined the average responses of respondents to the effects of diversifying *Phoenix dactylifera fructus* L. seeds based on the polyphenol, volatile, and phenolic compound content in decaffeinated coffee, can be explained as follows:

Colour Test of *Phoenix dactylifera fructus* L. Coffee Beans

The results of colour testing on coffee from *Phoenix dactylifera fructus* L. beans can be seen in Table 1 as follows:

Table 1. Distribution of Colour Test Frequency Results on *Phoenix dactylifera fructus* L. Seeds

Observation	Frequency	Percent	Valid Percent	Cumulative Percent
Don't Like	1	4	4	4
Don't Like it	4	12	12	16
Like	6	20	19	37
Really Like	10	32	30	72
Really Like it's Very Much	7	21	20	100
Total	**28**			

Based on Table 1, it can be explained that in the colour test or organoleptic test on the colour of *Phoenix dactylifera fructus* L. coffee beans, the highest percentage obtained was 32%, or 10, which means that the testers really liked the colour of *Phoenix dactylifera fructus* L. coffee beans. Meanwhile, the observation of 'very much liked' had a percentage of 21% with an observation frequency of 7 people.

Colour testing of decaffeinated coffee made from diversified *Phoenix dactylifera fructus* L. beans resulted in a dark colour in *Phoenix dactylifera fructus* L. coffee beans, making the colour of the coffee popular with the general public and even students. However, basically, the colour of coffee from *Phoenix dactylifera fructus* L. beans as decaffeinated coffee without diversification has a light colour and a burnt aroma.

According to Ali et al. (2025), coffee containing very large amounts of caffeine can cause caffeineism, stomach ache, insomnia, vomiting, nervousness, increased breathing and heart rate. Meanwhile, according to Yana et al. (2025), date seeds (*Phoenix dactylifera fructus* L.) have the potential to be used as a caffeine-free coffee substitute that is rich in antioxidant activity.

This is also because respondents prefer coffee with a rich colour, but not as rich as *Robusta* or *Arabica* coffee (Handayani & Muchlis, 2021). One factor that causes the colour of the coffee to be strong is the caramelisation of sugar, which produces a dark brown colour.

Based on this, tests were conducted to determine that the colour preference of *Phoenix dactylifera fructus* L. coffee beans, which contain phenolic and polyphenolic compounds, produces a dark colour similar to *Robusta* and *Arabica* coffee, whereby the roasting of the organoleptic characteristics of decaffeinated coffee from *Phoenix dactylifera fructus* L. beans is better. According to Nawirah et al. (2021), excessive screening and roasting processes will result in poor colour in coffee beverages made from *Phoenix dactylifera fructus* L. beans, as well as a bitter and burnt taste, thereby eliminating the flavour of coffee made from *Phoenix dactylifera fructus* L. beans.

Aroma Test of *Phoenix dactylifera fructus* L. Coffee Beans

The results of aroma testing on coffee from *Phoenix dactylifera fructus* L. beans can be seen in Table 2 as follows:

Table 2. Distribution of Aroma Test Frequency Results on *Phoenix dactylifera fructus* L. Seeds

Observation	Frequency	Percent	Valid Percent	Cumulative Percent
Don't Like	3	4	4	4
Don't Like it	6	12	12	16
Like	6	20	19	37
Really Like	7	32	30	72
Really Like it's Very Much	6	21	20	100
Total	**28**			

Based on Table 2, it can be explained that in the aroma test or organoleptic test on the aroma of *Phoenix dactylifera fructus* L. coffee beans, the highest percentage obtained was 32%, which means that the testers really liked the aroma of *Phoenix dactylifera fructus* L. coffee beans.

The results of the study and respondents among students and the community indicate that the aroma of coffee from *Phoenix dactylifera fructus* L. beans that have been roasted and then left to rest produces a very distinctive aroma, and that the aroma of coffee from *Phoenix dactylifera fructus* L. beans is liked by many people, including the community and students.

The distinctive aroma of coffee from *Phoenix dactylifera fructus* L. beans is not as fragrant as *Robusta* and *Arabica* coffee, but the aroma is not pungent and not too fragrant, and does not even have a pleasant aroma. This is in line with the opinion of Fauzi et al. (2019), who stated that the longer the roasting time of coffee beans, the more desirable the aroma of the coffee will be.

The compounds formed are volatile compounds, polyphenols and phenolics, which are formed due to non-enzymatic browning reactions caused by the degradation of amino acids, trigonelline and sugars. This occurs after the *Phoenix dactylifera fructus* L. seeds are roasted and cooled.

This indicates that respondents prefer the aroma of coffee from *Phoenix dactylifera fructus* L. beans because it does not have a strong aroma, but is liked by many people. This statement is in line with the opinion of Nawirah et al. (2021) and Gianing & Eliska (2023), who state that coffee from *Phoenix dactylifera fructus* L. beans produces a darker colour, resulting in a distinctive aroma that is not pungent or burnt.

According to Purnamayanti et al. (2017), the distinctive aroma of coffee arises from a reaction of caffeol caused by the content of compounds such as polyphenols and phenolics.

Texture Test of *Phoenix dactylifera fructus* L. Coffee Beans

The results of texture testing on coffee from *Phoenix dactylifera fructus* L. beans can be seen in Table 3 as follows:

Table 3. Distribution of Texture Test Frequency Results on *Phoenix dactylifera fructus* L. Seeds

Observation	Frequency	Percent	Valid Percent	Cumulative Percent
Don't Like	2	8	8	8
Don't Like it	5	16	16	21
Like	6	21	21	24
Really Like	12	43	43	87
Really Like it's Very Much	3	9	9	100
Total	**28**			

Based on Table 3, it can be explained that in the texture test or organoleptic test on the texture of *Phoenix dactylifera fructus* L. coffee beans, the highest percentage obtained was 43%, which means that the testers really liked the texture of *Phoenix dactylifera fructus* L. coffee beans.

The results of the study and the panelists' responses showed that the texture of coffee from *Phoenix dactylifera fructus* L. beans was preferred. This is because coffee with a thicker texture is more popular and even preferred by the general public.

Based on the analysis results, it was found that the thickness of the texture had no effect on the organoleptic characteristics of *Phoenix dactylifera fructus* L. coffee beans, regardless of the length of time the beans were roasted. The texture of *Phoenix dactylifera fructus* L. coffee beans is an internal characteristic of coffee that indicates a thickness in the coffee, reflecting the fibre and protein content of *Phoenix dactylifera fructus* L. coffee.

According to Widyasari et al. (2023), the sensation of a coffee's thickness is caused by lipid and polysaccharide compounds that have dissolved in water.

Coffee Bean Taste Test *Phoenix dactylifera fructus* L.

The results of taste tests on coffee from *Phoenix dactylifera fructus* L. beans can be seen in Table 4 as follows:

Table 4. Distribution of Taste Test Frequency Results on *Phoenix dactylifera fructus* L. Seeds

Observation	Frequency	Percent	Valid Percent	Cumulative Percent
Don't Like	2	8	8	8
Don't Like it	5	16	16	21
Like	6	21	21	24
Really Like	12	43	43	87
Really Like it's Very Much	3	9	9	100
Total	**28**			

Based on Table 4, it can be explained that in the texture test or organoleptic test on the taste of *Phoenix dactylifera fructus* L. coffee beans, the highest percentage obtained was 43%, which means that the testers really liked the taste of *Phoenix dactylifera fructus* L. coffee beans.

The results of the study and the respondents' opinions regarding the taste of coffee made from *Phoenix dactylifera fructus* L. beans indicate that it has a bitter taste, as is common with coffee. However, it does not have an overly bitter taste, making it acceptable to the general public.

The distinctive taste of coffee is not found in coffee beans from *Phoenix dactylifera fructus* L. However, it can provide significant health benefits such as reducing pain and treating high blood pressure, which is proven by the potassium content in *Phoenix dactylifera fructus* L. beans.

Organoleptic testing of *Phoenix dactylifera fructus* L. beans revealed that their taste, aroma, colour and texture are very similar to those of regular coffee. The taste of coffee derived from *Phoenix dactylifera fructus* L. seeds creates a combination of taste and aroma. According to Sitompul (2020), the pleasant taste that is enjoyed by many is greatly influenced by the processing of *Phoenix dactylifera fructus* L. seeds, which produces a pleasant aroma and taste.

Iron Content Test (*Felium*) of *Phoenix dactylifera fructus* L. Coffee Beans

The results of iron (Fe) content testing in coffee from *Phoenix dactylifera fructus* L. beans can be seen in Table 5 as follows:

Table 5. Results of Iron (Fe) Content Testing in *Phoenix dactylifera fructus* L. Seeds

No.	Parameters	Unit	Test Results	Test Method
1	Iron (*Felium* / Fe)	$mg.kg^{-1}$	43,1	AAS

Based on Table 5, it can be explained that in the iron content test of *Phoenix dactylifera fructus* L. coffee beans, every 100 g of *Phoenix dactylifera fructus* L. coffee contains 43.1 $mg.kg^{-1}$ of iron (Fe).

The iron (Fe) content is no less than twice the amount of the iron source. Based on this, the iron content can be calculated as 3.0 $mg.100\ g^{-1}$, yielding a result of 6.0 $mg.100\ g^{-1}$.

Iron (Fe) content is a major element that plays a role in blood formation, such as maintaining blood haemoglobin (Hb). In the body, iron deficiency leads to Hb deficiency, which is closely related to the occurrence of anaemia (Rieny et al., 2021).

CONCLUSION

The results of data analysis and hypothesis testing for each experimental treatment indicate that organoleptic characteristics such as colour, aroma and taste are not affected by the length of the roasting process of *Phoenix dactylifera fructus* L. coffee beans. However, a long roasting time of around 1 hour will produce a coffee colour that is most similar to other coffees, as well as the most fragrant aroma, and a thick texture that makes coffee from *Phoenix dactylifera fructus* L. beans suitable and highly desirable.

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