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Study of Some Chemical, Physical and Microbiological Properties of Five Types of Local Iraqi date Produc and Their Impact on Green Marketing

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Abstract. *This study aims to analyze the chemical, physical and microbiological characteristics of five varieties of local Iraqi dates, and the impact of these characteristics on the green marketing possibilities of these varieties of dates, with the aim of raising awareness about their value and enhancing their use in local and international markets. The results showed that the highest average of carbohydrates and sugars was in dates. Bream (59.81), (0.71), while the highest average in proline and protein was in the Khastawi variety (27.47), (2.54). The results also showed that the P-Value was less than 0.05, which indicates the presence of statistically significant differences between the types. Dates differ in their content of (carbohydrates, sugars, proline, and protein). As for the microbiological characteristics, including aerobic and anaerobic bacteria, fermentation, and rotting, the study revealed the presence of microbial contamination in all samples, and the date varieties showed differences in microbial groups, where the Al-Maktoum variety had the largest number. Of the aerobic and anaerobic bacteria (34,000), (2,800), while Barhi has the largest number of yeasts and molds (420), (260*).

Keywords: *Dates, Microbial Contamination, Green Marketing.*

INTRODUCTION

Dates are one of the oldest cultivated fruits in the world, and they have a long history in the Middle East, especially in Iraq [1]. The date fruit is considered one of the basic and important foods for the people of Iraq and the Arabian Peninsula, and to this day it still maintains its importance as a food with great economic and religious importance in the world. This part of the world [2], Iraq is known for producing multiple varieties of high-quality dates, as palm trees (Phoenix dactylifera L.) belong to the (Arecaceae) family, and palm trees are actually among the ancient and beloved trees in hot and dry regions of the world [3], capable of withstanding extreme temperatures, drought, and sandy soils. Studying the chemical, physical, and microbiological properties of local Iraqi dates is essential to understanding their quality and their impact on public health. It also plays an

important role in determining their nutritional and marketing value. Our interest comes in the positive impact of this study on green marketing. Promoting local date products and increasing their spread in local and global markets, therefore, highlights the importance of the study to better understand local varieties and support their green marketing [4], and local varieties can differ in their content of moisture and soluble solids, which can affect their quality and suitability. Spoilage [5], In addition, chemical analyzes can provide information about the nutritional content of dates such as protein, sugars, and minerals [6], Chemical analysis of dates is a powerful tool for understanding their quality and nutritional value. There are many studies that have focused on studying the physical and chemical properties of dates, including Iraqi dates, which gives us insight into their composition, characteristics and quality, as the chemical compositions of different Iraqi date varieties have been studied on a wide range. Including sugars and carbohydrates, their main components are glucose and fructose, with small amounts of sucrose [7],[8], It was also found that the protein content in Iraqi date varieties is relatively low, usually ranging from 3.01 to 3.15%, and their fat content is also quite low. In general, its value reached about 0.56% [9], In addition to the chemical properties, it is also important to evaluate the physical properties such as the size and weight of the fruits, as well as their color and texture. These characteristics can influence consumer preferences and the marketability of the product [10]. Furthermore, physical characteristics can provide indicators of fruit maturity and quality [11]. Iraqi date varieties have shown significant differences in fruit weight, size, and dimensions between varieties. Differences were also seen in color parameters, such as redness, yellowing, and brightness, between Iraqi date varieties [12]. Microbiological study of dates is also crucial to ensuring product safety. Dates can be susceptible to microbial contamination, especially during the processing and storage stages [13]. Microbiological analyzes can provide information about the types and numbers of microorganisms present, which can affect both the safety and quality of dates) [14], as studies have shown to The presence of yeasts, molds, and the presence of both aerobic and anaerobic bacteria, and the microbial load can be affected by several factors, including the processing method and storage conditions [15], By applying green marketing principles in marketing green products, awareness of the importance of preserving the environment and sustainability can be increased, and economic profitability can be achieved. For producers, by targeting environmentally aware and sustainable market segments [16], effective and sustainable green marketing of these products can be achieved, which enhances environmental sustainability and preserves natural wealth. Therefore, understanding the importance of green marketing of dates can provide valuable information to date growers, producers and traders. As well as for consumers interested in the quality of Iraqi dates, their nutritional value, and achieving both environmental and economic sustainability [17], as dates are considered an important source in the Iraqi economy, as many families depend on their cultivation and export as a source of livelihood. This study aims to educate producers and consumers about the dangers of microbial contamination. The importance of choosing the right products, and the results will help enhance our understanding of the characteristics of local dates.

MATERIALS AND METHODS

A. Collection of samples.

Samples of five local varieties of Iraqi dates (Al-Barhi, Al-Barim, Al-Zahdi, Al-Khastawi, and Al-Maktoum) were collected from different regions in Iraq during the harvest season. Dates were selected at the full maturity stage and in good condition, free of apparent defects. Samples were transported to the laboratory for immediate analysis [18].

B. Chemical analysis.

Analysis of sugars and carbohydrates.

Take 1 ml of diluted juice and add 1 ml of 5% phenol solution. With 5 ml of concentrated sulfuric acid, with continuous shaking, the solution was left to cool for 10 minutes, then the absorbance reading was recorded at a wavelength of 490 nm for carbohydrates and 550 nm for sugars [19].

Protein analysis.

We take (0.5) ml of the extract with the addition of 2.5 ml of Lowry's solution and 0.25 ml of Follen-Ciocalto reagent, then leave it for half an hour at room temperature and then read the absorbance at a wavelength of 750 nm [20].

Proline analysis.

The Bates method for proline extraction from dates using 3% sulfosalicylic acid involves mixing 2 ml of the extract with 2 ml of ninhydrin acid and 2 ml of glacial acetic acid. The mixture is then heated for one hour at 100°C. The reaction is terminated by placing the tubes in an ice bath, followed by the addition of 4 ml of toluene and thorough mixing. The absorption is measured at 520 nm, and the results are compared with a standard proline curve [21].

Physical analysis.

In the study of physical analysis methods for dates, the volume of samples was analyzed using a digital mass balance, and the volume (ml) of each sample was determined by the date water displacement method using the date water displacement method. The weight of the dates was measured using an accurate digital scale. For color analysis [22], Shell color was determined using a (colorimeter), These methods play a vital role in determining the type and quality of growth [23].

C. Microbiological analysis.

Detection of aerobic and anaerobic bacteria.

Aerobic and anaerobic bacteria in dates are detected by the counting method. 25 grams of dates were ground and mixed with 225 ml of sterile saline solution, then sample dilutions were made. 0.1 ml of each dilution was cultured on the nutrient agar medium. As for anaerobes, they were cultured in tubes containing... On thioglycolate medium, then covered with mineral oil to provide an anaerobic environment, they were placed in the incubator at 37°C for 24-48 hours for aerobic bacteria and 48-72 hours for anaerobic bacteria. Growth was observed and the developing colonies were counted [24].

Detection of rot and fermentation fungi.

Twenty-five grams of dates are ground and mixed with 225 ml of sterile saline solution, followed by serial dilutions of the sample. Then, 0.1 ml of the dilutions is plated on Potato Dextrose Agar (PDA) medium supplemented with an antibiotic to prevent bacterial growth. The plates are incubated at 25°C for 5-7 days. The plates are examined daily for fungal and yeast growth to calculate the total colony-forming units (CFU) per gram of dates and to identify the types of microorganisms present [25].

Statistical analysis.

The SPSS software was used for statistical data analysis. An Analysis of Variance (ANOVA) test was conducted to calculate the significant differences between the different types of dates.

RESULTS AND DISCUSSION

A. Chemical properties.

The results of Table (1) showed that the highest average of carbohydrates was in Al-Barim dates (59.81), while Al-Zahdi dates contained the lowest average of carbohydrates (27.43), while Al-Maktoum dates had the highest standard deviation (11.52), and this indicates a large variation in the content of Carbohydrates. The lowest coefficient of variation was in the Khastawi variety (6.08%).

The highest average of sugars was in the Bareem variety (0.71 grams), while the Khastawi dates contained the lowest average of sugars (0.30), and the highest standard deviation in Al Maktoum (0.111), which indicates a greater variation in sugars content, and the lowest coefficient of variation in Barhi dates (9.237). %). As for the proline content of dates, Khastawi dates contain the highest average proline (27.47),

While Al-Zahdi dates contain the lowest average proline (6.84), and among Al-Maktoum dates the largest standard deviation (3.19), which indicates a greater variation in proline content, and Al-Zahdi dates had the highest standard deviation. It has the lowest coefficient of variation (7.75%). As for its protein content, the highest average protein content was in Al-Khastawi dates (2.54), and the lowest average in Al-Barim dates (1.04), and Al-Khastawi dates recorded the highest standard deviation (0.31), and the lowest coefficient of variation was in Al-Zahdi dates (6.15%).

Table 1. Calculating the means, standard deviation, and coefficient of variation for each content according to the type of dates

Varieties of dates	Carbohydrates			Sugars			Proline			Protein		
	mean	Std	CV%	mean	Std	CV%	mean	Std	CV%	mean	Std	CV%
Maktoum	56.60	11.52	20.34%	0.627	0.111	17.66%	10.63	2.08	19.57%	1.85	0.13	7.03%
Bream	59.81	10.39	17.38%	0.71	0.101	14.32%	21.86	2.93	13.40%	1.04	0.22	21.1%
Barhi	36.81	2.84	7.704%	0.396	0.037	9.237%	18.86	2.68	14.21%	2.07	0.16	7.73%
Khastawi	37.42	2.28	6.08%	0.30	0.056	18.61%	27.47	3.19	11.61%	2.54	0.31	12.2%
Zahdi	27.43	1.68	6.12%	0.352	0.052	15.00%	6.84	0.53	7.75%	1.95	0.12	6.15%

Table 2. p-value for each date content and for all types

Types of dates	Carbohydrates p-value	Sugars p-value	Proline p-value	Protein p-value
Maktoum Bream Barhi Khastawi Zahdi	0.041472	0.021914	0.000203	0.00258

The results of Table (2) showed that all p-values are less than 0.05, which means that there are statistically significant differences.

B. Physical properties

The results of Table (3) showed that the live ber is the type that weighs the most (16-25 grams) and is the largest in size (10-14 cm3) among the other types, while the zahdi type is the type that weighs the least (6-9 grams) and is the smallest in size (6.68). cm3), among other types (26).

Table 3. Physical characteristics of different types of Iraqi dates.

Types of dates	size	Weight	Veneer color
Maktoum	10-14 cm3	16-25 gm	Bright yellow
Bream	7-11 cm3	8-11 gm	Greenish yellow
Barhi	6-9 cm3	5-10 gm	light brown
Khastawi	9-11 cm3	9-11 gm	Nailed red
Zahdi	8-10 cm3	8-13 gm	Reddish orange

C. Microbiological characteristics.

Table 4. Microbiological analysis of different types of Iraqi dates.

Types of dates	Aerobic bacteria (cfu/g)	Anaerobic bacteria (cfu/g)	Yeasts (cfu/g)	Putrefaction (cfu/g)
Maktoum	34,000	2,800	350	190
Bream	32,000	2,600	420	260
Barhi	28,000	2,200	380	210
Khastawi	29,000	2,400	390	230
Zahdi	30,000	2,500	400	240

The results in Table (4) showed that the highest percentage of aerobic and anaerobic bacteria was in the Maktoum variety, 34,000 [2,800], while the Barhi had the highest number of yeasts and molds [420] [260].

DISCUSSION

The importance of these results is that they reveal a potential problem related to food safety in Iraq, especially since dates constitute a major part of the population's diet, as the current results indicated that Prem dates contain the highest amount of carbohydrates and sugars compared to other types of dates, because they contain They contain high percentages of sugars such as glucose and

fructose, as well as sucrose, and this is consistent with a recent study that showed that dates contain large percentages of carbohydrates, up to 70%, consisting mainly of glucose and fructose [27]. The results also show that Khastawi dates contain the highest An amount of proline and protein compared to other types, due to environmental conditions and cultivation methods that affect the amino acid content in dates. Proline is considered an important component in dates for its role in improving resistance to osmotic stress and improving the quality of fruits during storage. There is a study that indicates the accumulation of proline along with sugars. Soluble dates are important for confronting drought conditions, as proline helps with osmotic adjustment and protects cells from oxidative stress [28], and in a study conducted in Saudi Arabia, Khalas dates contain high levels of protein and sugars, which makes these fruits nutritional benefits in the daily diet [29], These results also indicate that there are real differences in the contents of these dates (carbohydrates, sugars, proline, and protein). Also, among all types of dates, aerobic bacteria were the most prevalent, followed by anaerobic bacteria. The numbers of aerobic bacteria ranged between 28,000 to 34,000, and this indicates a moderate level of bacterial contamination. The results also showed that the numbers of yeasts and molds were much lower than the bacteria, because the storage conditions were relatively good. The numbers of yeasts ranged from 350 to 420, while the numbers of molds ranged From 190 to 260, and in a study conducted on Saudi dates [30], they found that the average total bacterial count ranged from 3,100 to 27,000, and this is consistent with the results of the current study of Iraqi dates, and in a different study conducted on Algerian dates [31], they found that The total bacterial count was higher, reaching 100,000 to 1,000,000 in some samples. This is higher than what was found in the current study, and according to Food and Agriculture Organization (FAO) and World Health Organization (WHO) standards, the maximum allowable total bacterial count in dates is 10,000 [32]. Most samples in this study slightly exceeded this limit.

CONCLUSIONS

This study contributes to our understanding of the characteristics of local Iraqi dates, and can provide valuable information to date growers, producers, and traders. By understanding the differences between varieties, appropriate strategies can be developed for processing, storing and marketing each variety, ensuring the quality and nutritional value of the final product. The results also indicate the need for more research in this area. Future studies could include evaluating the sensory characteristics of local varieties, consumer preferences, and the marketability of these varieties in local and global markets. Moreover, studies can be conducted on the health effects of Iraqi dates, due to their high content of beneficial nutrients

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