



Physicochemical and Microbiological Characteristics of Dates syrup (Dibs) Samples from Hodaidah Regions- Yemen

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Abstract This research paper investigated the physicochemical and microbiological characteristics of twenty dates syrup (Dibs) samples from Hodaidah regions. The microbiological characteristics evaluated were total aerobic mesophilic bacteria, total coliforms, moulds and yeasts while the physicochemical properties were pH, moisture content, ash content and electrical conductivity, total solids, total solids soluble, protein content and fiber. Results showed that good properties of dates syrup (Dibs) were produced in two regions from Hodaidah Governorate. There was significant difference in the pH of the Dibs samples obtained from different regions. Minimum pH of 4.50 was observed from Dibs sample collected from AL- GahAlala`a, while the highest pH value of 4.63 was from Dibs collected from AL- GahAlasfal. Electrical conductivity varied from 31.3 and 78.4 $\mu\text{S}/\text{cm}$ while moisture content between 18.2% to 22.7%, the values of ash content varied in the range of 1.79 and 2.8 % and the total sugar contents of the sample varied between 74.7 and 78.8 %. Results of the microbiological characteristics showed that the microbial profile was very low for all the microorganisms studied. The TAMB varied from $100-6 \times 10^3 \text{ cfu g}^{-1}$ whereas total coliform and yeast were not detected in any of the samples while moulds were also present at low counts in all the Dibs samples obtained from two regions. These results obtained indicate that the investigated product is suitable for internal and external marketing.

Keywords Dates syrup (Dibs), Physico-chemical, microbiology, Characteristics, Hodaidah, Yemen

Introduction

Since ancient centuries, dates palm (*Phoenix dactylifera* L.) is being an important food crop economic and in Yemen. It ranks first among the fruit crops group, where cultivated area with dates palm ranged from 14,464 to 14,955 ha during the period 2008- 2012, constitutes about 25 percent of the total fruit area, which produce 55,181-57,849 mt of dates at the same period [1]. Palm dates cultivation is concentrated in Yemen in different areas, including Hodeida, Hadhramout and Al-Jawf. Production at these three provinces amounts to about 19,910 tons, representing 96.7% of Yemen's date production.

In Hodiedah, Palm cultivation is concentrated in different areas, including Bit alfaqeih, Zabid and Alkokah the culture area of date palm is 4939 ha which constitutes 29.3% of total Yemeni areas of dates, where the number of date palm in 2007 was 840,340,1 trees, producing 1258 tons with 51 varieties[2].

Dates are nutritious, high-energy food, and an important element of the diets of people in Yemen and are consumed fresh, dried, or in various processed forms like dates syrup (Dibs) [3]. Dates syrup (Dibs) is probably the most common derived date product. It is produced as an incidental by-product when bagged humid dates are heaped for their own weight. Also, it is produced at the home and in villages by extraction and boiling down of juice, and on a semi and full industrial scale [4].

In the present study, we have investigated the microbiological and physico-chemical characteristics of dates molasses (Dibs) varieties produced in Hodaidah areas.



Materials and Methods

Sample collection

Twenty Dibs samples were collected from different geographical locations in two sub-regions (Al-Gahalalaa and Al-GahAalafal) in Tohaita region, Hodaida province (10 from each region) and 4 samples of Dibs were imported for comparison. The samples were collected in February 2014. All the samples were collected fresh in sterile containers and stored at ambient temperature until needed for the analysis.

Microbiological analysis

Microbiological analysis of the Dibs samples was carried out as described by Omafuvbe and Akanbi [5]. To determine total aerobic mesophilic bacteria, total coliforms, moulds and yeasts. The condition of Microbial analysis is described in table 1.

Table 1: The condition of Microbial analysis of Dibs samples

Microorganisms	Media of Isolation	Temp (°C)	Time	Incubation
Total aerobic mesophilic bacteria (TAMB)	Plate count agar	30 ± 2°C	48h	Aerobic
Total coliforms (TC)	Violet red bile glucose agar	35 °C	24- 48 hrs.	Aerobic
Moulds (M)	Sabouraud dextrose agar	25°C	3-5 days	Aerobic
Yeasts (Y)	Sabouraud dextrose agar	25°C	3-5 days	Aerobic

Physicochemical analysis

Moisture content, total solids, total solids soluble, ash, protein content and Fiber were determined according to the modified method of AOAC [6]. pH and electrical conductivity were measured by pH meter (after it was calibrated at pH 4.0 and 7.0 using standard buffer solutions) in a solution containing 10 g of Dibs sample in 75 ml of distilled water based on the methods of analysis proposed by the Association of Official Analytical Chemists.

Statistical analysis

The results obtained in this study were analysed statistically using SPSS program.

Results and Discussion

Physico-chemical characteristics

The physico-chemical properties of the different samples of Dibs are displayed in Table 2. The pH value of Dibs samples ranged from 4.50 and 4.63 while the imported type was 4.65. These values are similar to those obtained by Almnahel [7] and Al harethiet *al.* [8], but less than those obtained by Idrees *et al* [9] (pH means value 5.5). The low pH of high level of sugar products like honey and Dibs inhibits the presence and growth of microorganisms. These parameters have great importance during the extraction and storage, as they influence the texture, stability and shelf life of these products [10].

The electrical conductivity (EC) values of the Dibs samples varied from 31.3 and 78.4 $\mu\text{S}/\text{cm}$. Electrical conductivity measures all ionisable organic and inorganic substances present in Dibs. It has been reported to be related to the botanical origin of dates and very often used in routine Dibs control instead of the ash content [11-12].

The moisture content of Dibs samples investigated varied from 18.2% to 22.7% (Table 1). There was a significant difference in the values of moisture content of Dibs. The results presents in this study are in agreement with the studies of Ramadan [13] and Ali [14], that have also found higher values of moisture content in Syrian Dibs. On the other hand, Almnahel [7] and Al Harethi[8] found higher values than ours (24 and 25.77%). The moisture content variation can be explained by the composition origin of Dibs samples. The low



moisture content of Dibs forms an important part of the system which protects Dibs from microorganism attack [13, 15]. These results are indicating of good storage ability of these Dibs types, since high moisture content could lead to fermentation during storage.

The ash content of the Dibs samples varied between 1.79 and 2.8 %. Similar values were obtained by Al Harithi [8], who analysed samples of Libyan Dibs. The palm origin of Dibs has been reported to be responsible for the variability in ash content [14].

The values of protein content for the Dibs samples obtained ranged from 0.35 to 0.55 %. Small amounts of protein contain in Dibs are also found in other countries Syria [16], Iraq [17], Libya [8].

The total sugar contents of the Dibs sample varied between 74.7 and 78.8 % (Table 1), these values were statistically similar across the studied types of Dibs [8, 16, 18]. Sucrose is the main sugar in Dibs, while reducing sugars (fructose and glucose) are predominant in others. Total sugars represent about 60 -80 % of the dry matter in most type of Dibs [19].

The total soluble solids (TSS) values of Dibs samples investigation varied from 75.2 to 78.8 brix. This value is similar to that obtained by Al Harthi [8] and Barafed, [17]. The total soluble solids and refractive index of the Dibs were higher. This principle is due to the high level of sugar and relatively low moisture content.

The fiber values of the Dibs samples ranged from 0.340 to 0.425 were similar results reported for Syria Dibs by Goli [16]. Fibers are claimed to prevent many metabolic or digestive diseases. It is usually defined as the part of the diet which is resistant to human digestive enzymes [19-21].

Table2: The physico-chemical properties of the different samples of Dibs

Dates Samples		Physico –chemical variables							
		pH	EC (µS/cm)	Moisture (%)	Ash (%)	Proteins %	TS %	TSS %	Fiber %
AL- GahAlala`a	1	4.53	40.3	19.7	2.2	0.47	78.1	78.8	0.425
	2	4.63	48.7	20.45	1.98	0.35	78.5	78.2	0.370
	3	4.60	61.3	21.65	1.79	0.52	77.3	77	0.375
AL- GahAlasfal	1	4.50	31.3	18.2	2.28	0.55	74.7	79	0.410
	2	4.50	78.4	21.9	1.89	0.35	76.2	75.2	0.355
	3	4.55	46	20.2	1.97	0.47	77.2	76.5	0.340
Imported types	1	4.65	65.5	22.7	1.79	0.5	76.25	77	0.350
	2	4.64	64.4	22.5	1.82	0.45	75.9	76.5	0.355
	3	4.65	64.9	22.6	1.79	0.48	76.08	76.7	0.353

Microbiological analysis

The microbiological characteristics of Dibs samples obtained from Al Gah regions are presented in Table 3.

Table 3: The microbiological characteristics of Dibs samples

Dibs Samples		Microbial counts cfug-1 sample			
		TAMB	TC	M	Y
AL- GahAlala`a	1	5X10 ³	-	3	-
	2	6X10 ³	-	5	-
	3	5X10 ³	-	1	-
AL- GahAlasfal	1	4X10 ³	-	5	-
	2	4X10 ³	-	4	-
	3	4X10 ³	-	4	-
Imported types	1	4X10 ²	-	-	-
	2	10 ²	-	-	-
	3	10 ²	-	-	-

TAMB: Total aerobic mesophilic bacteria, TC: Total coliforms, M: Moulds, Y: Yeasts

The total aerobic mesophilic bacteria (TAMB) count were found in low numbers in most samples of Dibs with a minimum count of 4x10³ cfu.g⁻¹ and a maximum of 6x10³ cfu.g⁻¹. Total coliforms were not detected in any of the Dibs sample, similar as in the studies conducted by and Ramadan[13], Belalaet *al.* [22] and Aleid et al. [23].



This may be explained by the evidence that Dibs is well preserved against bacteria. Consequently such microorganisms would not survive unfavorable conditions. A few samples of Dibs contained detectable levels of moulds, below 100 cfu.g⁻¹. This range may approach data reported by Al Harthi [8], Aleid *et al.* [23] and Ziadi *et al.* [24]. There were no yeasts in all the Dibs samples studied. The microorganisms that may be found in Dibs are mostly spore-forming bacteria, but no disease causing bacteria species had been detected in Dibs samples. Therefore, Dibs like honey has inherent antimicrobial properties that can delay or inhibit growth of many microorganisms.

Conclusion

The results obtained in this study showed that the physico-chemical properties of Dibs produced in Al Gah regions (Hodaidah areas) compare favorably with Dibs from other countries. The Dibs samples contained low numbers of aerobic mesophilic bacteria while total coliform and yeast were not detected. The presence of mould and some bacteria in some samples may be attributed mainly to contamination and that is due to poor handling at extraction or packaging. Ultimately, the results obtained indicate that the investigated product is suitable for internal and external marketing.

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