



Study of Some Chemical Properties of Home made Dates Syrup (Rub Al-Tamr) in Some Libya Cities

Adel Mlitan^{1*}, Zubaida Bait-elmal² and Hagir Abd Allah³

^{1,2}Chemistry Department, Faculty of Science Misurata University, Libya

³Food Industries Department, Faculty of Agriculture, Misurata University, Libya

*Corresponding Author: adel_mlitan@sci.misuratau.edu.ly

Abstract:

This study was conducted at Misurata city. It aimed to study some chemical properties of home made date syrup. The date syrup samples (Bikrari, Degla, Ameer, Tabone and Arhata) were obtained from the local market from some Libyan cities and analyzed. Dates syrup quality properties were assessed by different parameters: Ash content, Moisture, Total solids, total sugars, proteins, lipids, Fibre and pH. The results of this study showed that the investigated samples were low content of fat, proteins, Fibre and Ash, but it was high in contents of moisture and carbohydrate. Also Caloric value and Electrical conductivity were calculated in this study.

Keywords: Date syrup, Chemical composition, Dates, physical properties

Introduction

The date palm is one of major fruits trees in Arabic world [1,2], especially in Libya. There are more than 4 million palm trees in Libya which yield around 87,000 tons of dates. The present Libyan production represents about 5% of the total world production. [3] There are many varieties of dates grown locally, but Bikrari, Degla, Ameer, Tabone and Arhata constitute the main varieties grown in Libya. No statistical data are available concerning the individual production of each variety. The world production of dates has increased during near the past years, according to FAO statistical data in 2010 [4]. The date palm has played an important role in the production of date syrup (Rub Al-Tamr) that thick liquid extracted from date palm fruits, a solution made since ancient times and in different ways. It considered to be of economic value and food task, since it has a high concentration of sugars, mineral elements and vitamins such as vitamin A and B [5,6]. Date syrup locally known as Rub Al-Tamris the most commonly derived date product. In date syrup industry the fruits are mixed with water and heated, when the sugars are extracted and easy to save for long periods without any additives colors or preservatives reagents [7], it is high energy food rich in saccharides that been used as raw material of some traditional and industrial foods [2,8,9,10]. The present study aimed to identify some physicochemical and biochemical properties of home made Libyan date syrup and compared the results obtained with previous studies.

Material and Methods

The home made dates syrup samples were collected from local market from some Libya cities (Misurata, Sabah, zlitan and Aljafra) during the year 2020 which present. Standard methods by AOAC (2000) [11] were used to determine the Carbohydrate content, crude Fats, crude Fibres, Protein, Ash, Moisture content and Total solids (TS) of the samples. Total energy (Caloric value) and Electrical conductivity were calculated. pH measurement was performed using a pH meter.

Physical analysis

pH measurement

10% (w/v) solution of dates syrup was prepared in milliQ water for pH measurement using a pH meter (JENWAY -3510 pH meter). [11].

Moisture: Moisture content was determined by the standard AOAC (1990) method for which a known weight (2 g) of sample was placed individually in a moisture dish and dried in a hot air oven set at 105°C until constant weight were obtained.[11]

$$\% \text{Moisture} = \frac{M_{\text{INITIAL}} - M_{\text{DRIED}}}{M_{\text{INITIAL}}} \times 100$$

$$\% \text{Total solids} = \frac{M_{\text{DRIED}}}{M_{\text{INITIAL}}} \times 100$$

$$\% \text{Total solids} = (100 - \% \text{Moisture}).$$

Where: M_{INITIAL} and M_{DRIED} are the mass of the sample before and after drying, respectively

Ash: Take the weight of the empty crucible and the lid and measure 5 g of the dates syrup sample into the crucible and weigh again to obtain initial weight. Then place it on a hot plate at a temperature of 550°C for 12 h. Remove and transfer the crucible with the sample into a desiccator and allowed to cool. Weigh it again to obtain the final weight. [11]

Electrical conductivity (EC)

The EC was calculated, depending on the ash content, according to the following equation reported by: $\text{EC (mS/cm)} = 0.14 + 1.74 \times A$ in which A is the ash content (g/100 g). [12]

Total energy (Caloric value): The total energy value was calculated using the crude protein, crude fat and carbohydrate contents of the based on the following formula.

Total energy K cal/100g = Protein x4.0 K cal/100 g + Fat x9.0 K cal/100g + Carbohydrates x4.00 Kcal/100 g. [13,12]

Biochemical Analysis

Crude protein: Samples subjected to protein analysis in triplicates using a Kjeldahl digestion/distillation. 0.2g of sample was weighed and digested along with conc. H_2SO_4 and a pinch of digestion mixture (NaSO_4 : CuSO_4 at the ratio of 9:1) in a Kelplus digester at 350°C for 4 h until the sample became colorless. The digested sample was diluted to 100 ml in a volumetric flask with distilled water. About 5 ml of aliquots was distilled for 10 min with 40 % sodium hydroxide in a Kelplus distillation apparatus and the distillate was collected in 2% boric acid solution containing mixed indicator. The nitrogen content was determined by titration against standard N/70 H_2SO_4 solution. The crude protein content was then calculated by multiplying with the factor 6.25. [11]

Crude Fat: 2 g of sample was placed individually in a thimble and kept in the pre-weighed extraction flask. The flask was filled with 2/3 volume of petroleum ether and the apparatus was assembled. Extraction was carried out for about 2 h at 200°C. After the extraction, excess ether was carefully collected and the residual ether was evaporated to dryness. After drying, measure the weight of the round bottom flask containing the extract. Wash the flask and then measure the weight of the flask after washing. [11]

Total carbohydrate: Total carbohydrate was estimated by the Anthrone method. 2 g of wet homogenate was taken individually and homogenized with known volume of 5% Indol-3-acetic acid (TCA). The homogenate was then centrifuged at 2500 rpm in a centrifuge for 10 min and the supernatant was filtered. To the filtrate, anthrone rea-



gent was added, placed in a serological water bath for 10-15 min for color development. The distilled water served as the control. The colored end product was measured for their optical density at 620 nm in a UV–VIS Spectrophotometer. Also can determine by calculation (by difference) as follows: % Carbohydrate = 100% – (%Moisture + %Crude Fat + %Crude Protein + %Ash). [11]

RESULTS and DISCUSSION

Table 1. Chemical composition, pH, Total Energy and Electrical Conductivity of some Libya dates syrup

Nutritional comments	Bikrari	Degla	Amee	Tabone	Arhata
pH	4.17	4.21	4.20	4.20	3.20
Total Solids	82.96%	73.3%	79.93%	58.91%	63.11%
Total Energy	332.8 Cal	291.3 7Cal	320.35C al	232.6 Cal	250.51C al
Moisture Content	17.04%	26.70 %	20.07%	41.09%	36.89 %
Crude Protein	0.31%	0.36%	0.20%	0.40%	0.26%
Crude Fat	0.20%	0.21%	0.15%	0.12%	0.11%
Crude Fibre	0.04%	0.01%	0.02%	0.04%	0.00%
Total Ash	0.009%	0.71%	0.007%	0.60%	0.62%
Electrical Conductivity	0.01692m s/cm	1.334 8ms/c m	0.01316 ms/cm	1.128m s/cm	1.1656 msv/cm
Carbohydrate	82.44%	72.01 %	79.55%	57.48%	62.12%

pH

In this study, the pH values of Libyan dates syrup were found between (3.20 – 4.21) as shown in table1. These values are in agreement with the studies conducted by Egyptian researcher[7] on date syrup (molasses) which found that the values of the pH a range of (3. 20 and 4.3). In other studies for Saudis researchers [13,14] found that pH range between (4.55 and 4.91). As for one of the Iranian researchers [29] have said that the pH value of date syrup of the product in Iran is (4.20) and Iraq dates syrup pH values found between (4.5 and 5). [15] Comparing the results of this study with the Libyan standard specifications for dates syrup, that not be less than (4.3). In this study note that Arhata was less the limit required, which constitutes (3.20).

Moisture Content

The water content is a basic parameter for the determination and rational conduct of harvesting, storage and conservation [16]. The water content of different varieties studied ranged from (17.04% to 36.89 %). Variety Arhata and Tabone had the highest rates and Birkari variety showed the lowest rate. These values are in different with the study conducted by Gourchala *et al* [17] who showed that the moisture content ranged from (14.48% to 26.0%) and by Ahmed *et al.* [18] (9.20% and 32.10 %). But these levels are significantly lower than that found in the Aziza variety reported by Acourene *et al.* [19] and less than Yassine Nou *et al.* [20], this difference can be explained by the humidity of the storage and geographical distribution each palm. [19] The results of water with the Libyan standard specifications for dates syrup percentage not more than (30%)[20], note that some samples were not in the limit required, which constitutes (36.89 to 41.09) % of the Tabone and Arhata. The Birkari sample was recorded highest percentage resulted in the ratio of the total solids (82.96%).

Total Ash and Electrical Conductivity (EC)

Samples analyzed in this study showed an ash content of ranging from 0.007% (Amme) and 0,62 % (Arhata). These values are in agreement with the study conducted by Nou *et al.* [21]. Differences between cultivars were recorded during a study conducted by Acourene *et al.* [19] and Algerian varieties with rates ranging between (1,1% to 3,7 %). Some authors[16] and[22] reported changes in palam ash content (2,15 to 3,46 %) for Moroccan varieties, (2,53 % to 3,20 %) for Sudanese varieties and (1,49 to 1,79%) for Omani ones respectively. Ash with the Libya standard specifications for dates syrup percentage not be highest than (2.6%)[20], note that all samples were at the limit required. EC values ranged between (0.1316 mS/cm and 1.3348 mS/cm), followed by Amm and Degla, The lowest EC value was found for Amm (0.1316 mS/cm).

Carbohydrate

Carbohydrate of the five varieties of dates syrup showed that Carbohydrate represent the major part of the dates syrup (Table 1), giving them an important energy value. Birkari contains the highest content of total sugars (82.44%) and Tabone shows the lowest level in sugar, less than (57.48 %). This value are in agreement with the new study conducted by Abd Allah *et al.* [23], they found that (52,20% to 65,1%) levels for libya varieties. Similar observations on variability were reported by other authors on other varieties of dates. In Algeria, Acourene *et al.* [19] found similar high levels of total sugars, greater than 80 % for some levels ranging from 61 % to 83 % for Moroccan varieties. Ben Ismail *et al.* [13] observed rates between (44% to 62,7%) for Tunisian varieties. Some studies conducted on Saudi, Emirati and Omani dates [16] showed that the varieties containing only glucose and fructose have low total sugar rates. Carbohydrate with the Libyan standard specifications for dates syrup percentage not be less than (65%), Tabone and Arhata were less the limit required, which constitutes (57.48% to 62,12%)[20]. Energy value equal (232.6 to 332.8) cal.

Proteins

Protein levels are low in the five studied varieties. A difference was found between the (0.20% to 0.40%) varieties rates. These results are Low to those for two varieties of Pakistan (2.4% and 2.7%) [24] and five varieties of Libya study (1.98 % to 3.34%) [23].



Fat

The lipid content of dates syrup is very low for the different varieties, the values obtained ranged from (0,11% to 0,21%) for Arhata and Degla respectively. These levels are in agreement with conducted by Abd Allah *et al.* [23] found that (0.0% to 0.43%) levels for libya varieties and low comparable to those reported for Emirati dates, i.e.(0.2% to 0.5%) [25] and (0.38 % to 0.66%) for south Algeria of dates [17].

Fiber

The fiber content ranges from (0,00% to 0,04%) Arhata % and Bokrariin fiber. These levels are very low compared to (6,04% to 11,05%) found for other varieties [30], and the result reported by Elleuch *et al.* [26] for two cultivars of Tunisian dates (14,4% and 18,4%). High levels of fiber may give to dates a beneficial impact on health [27]. Fiber is considerably correlated to the glycemic index of food [28] and [17].

Conclusion

The results of this study show the variability of some quality characteristics of the date syrup sample from some libya cities. the date syrup samples differ in quality on account of various factors such as the activity of the date plam, the period and technique of extraction of the date syrup , conditions of storage , the freshness of date. and difference in the agricultural environment (temperature, humidity, soil). All date syrup samples were slightly acidic, in the pH range 3.20-4.21. The ash, fat, proteins and Fibre content were low while the moisture and carbohydrate ratio were higher in the all samples. The pH of Arhata and Carbohydrate Tabone and Arhata were less the limi required of standards of Libya. The moisture content of Tabone and Arhata was not in the limit required in standards of Libya. All Ash content samples were at the limit required standards of Libya.

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دراسة بعض الخواص الكيميائية لرب التمر (الدبس) المصنع منزلياً في بعض المدن الليبية

عادل محمد مليطان¹ وزبيدة فوزي بيت المال² وهاجر محمدصالح عبدالله³

¹ قسم الكيمياء كلية العلوم جامعة مصراتة-ليبيا

³ قسم الصناعات الغذائية، كلية الزراعة، جامعة مصراتة، ليبيا

الملخص

تم جمع عينات من رب التمر (الدبس) من السوق المحلي وتحليلها. تم فحص بعض الخواص الكيميائية لخمسة عينات من الرب (البكراري، الديقلا، العامي، الطابوني والرھاطه) ، حيث تم تقييم جودة رب التمر الليبي بمعايير مختلفة مثل: محتوى الرماد ، الرطوبة ، المواد الصلبة، السكر ، البروتينات ، الدهون ، الألياف ، pH . أظهرت الأصناف المدروسة نسبة منخفضة من الدهون والبروتينات والألياف والرماد، ولكن كميات عالية من السكريات والرطوبة. كما تم حساب قيمة السرعات الحرارية والموصلية الكهربائية في هذه الدراسة .