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EVALUATION OF DIBIS SYRUP PRODUCED BY VARIOUS METHODS PRODUCTION

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ABSTRACT

Dibis syrup was produced from two kinds of fresh dates (Amahat and Siwi dates) by cold and hot extraction methods. Another product was obtained by replacing the mollasses in the local product called "Mifattaka" by date syrup "Dibis". Sugar components were identified by HPLC and the organoleptic scores were recorded for the prepared syrups. The results show that the yield of dibis syrup from siwi dates was more than that of Amahat dates. The syrup produced by cold extraction had higher levels of proteins, carbohydrates and energy compared with that obtained by the hot extraction. Glucose levels in all samples were higher than that of fructose. On the contrary, the samples contained lowest levels of sucrose compared with control sample. The organoleptic characteristic scores of dibis produced by cold extraction were higher than those obtained by hot extraction method. Mifattaka purchased from the local market had higher taste score compared with mifattaka containing dibis or mallassess.

INTRODUCTION

Dates *(Phoenix dactylifera L.)* are well known as an important desert crop in the regions of Middle and Estern countries (Mohammed *et el.*,1983). The main date producing countries in the world are: Iran, Iraq, Egypt, Saudi Arabia, Pakistan, Algeria, United Arab Emirates, Sudan, Oman, Tunisia, Morocco, Libya and Yemen (Dawood *et al.*, 2002). Dates constitute the main part of the diet for the majority of the population in the rural areas. They are also important for the ecology of different countries, being the most adaptive and tolerant crop to various environmental extremes and stresses such as high temperatures, drought and salinity (Benyamin, 1993).

The usual method of picking and packing soft dates is still carried out without any modifications. Farmers pick up the soft dates by hand and delicately keep them in an open baskets for immediate sale in the local markets. Here, the problem is generally complicated, as harvesting soft dates in a short period of time creates temporary surpluses. Unless the crop is immediately marketed, this squashy fruits of 35-40% moisture content will undergo microbial spoilage (Al-Obaidi *et al.*,1985).

Date fruits are highly nutritious food products since it contain many vitamins and minerals. Date fruits are exceptionally rich in K and Fe and extremely low in Na, and highly desirable for hypertensive persons who are advised to consume low Na diets (Al-Hooti *et al.*, 2002). The pasta from semi-dried dates due to its high nutritive value used for pregnant and lactating woman (Salem,1998).

Date syrup (locally named dibis) is the most common date product. It is produced by two different ways; either at domestic or village level by extraction and boiling the juice, or a semi or at full industrial scale, the process consisting of extraction, clarification and concentration of the date juice (Al- Farsi, 2003).Few attempts have been made to use dates in various

applications such as the production of milk-date drinks (Yousif *et al.*,1986), soft drinks (Hamed and Al-Beshr, 1993), ice cream and frozen desert (Hamed *et al.*, 1993) and date juice (Benyamin *et al.*,1982).

In general, the main date products are date paste, date syrup and packaged dates. Secondary products are date vingar, syrup, spread and fermented products such as citric acid and single cell protein. One of the most important steps in secondary processing of dates is to extract most of its soluble solids for further processing. Thus, date juice has to be stored for sometimes to be processed in different unit operations (Assiry, 2003).

The aim of the present study was to explore the best date extraction method, and to highlight on the possibility of producing some important processed products from date fruits.

MATERIALS AND METHODS

Materials:-

Fresh ripen date fruits of two commercial varieties, i.e., Siwi and Amhaat dates were obtained from the local market at Giza city, Egypt. Other, materials such as sesame seeds, powdered fenugreek seeds, black seeds, green seeds, lemon salt "Molassess and mifattaka" were also purchased from the local market at Giza city, Egypt. The corn oil was mixed by olive oil at a ratio of [1:1, v/v].

Methods:

Extraction of date fruits

1.1. Cold extraction method:

One kilogram of Amhaat and Siwi (samples 1 and 2) date fruits was washed with tap water and the stalks and calyxes were separated. Three liters of water with one spoon of lemon juice were added to the pulp date fruits and left overnight. Date juice was obtained by squeezing for mentioned mixture using nylon cloth and rewashed with other three liters of water and left overnight in the refrigerator. Then the fruit residue was proned to the later process once again.The combined juice was concentrated using water path at 100°C for 12 h to obtain date syrup (78.1 % T.S.S) and kept in Jars till use.

1.2. Hot extraction method:

Sample (3).

One kilogram of Siwi fruits were soaked in 2 liter hot water, boiled for 1 h. filtered, hot water (1L) was again added and reboiled for 1 h. The produced syrup was filtered and concentrated in a boiler with the addition 0.1% of citric acid. The syrup was concentrated by heating at 80°C till 70% T.S.S. was obtained. The prduced syrup was cooled down and kept in glass jars till use.

Sample (4).

One kilogram of Siwi date fruits was soaked in 3 liter hot water, heated at (80°C- 85°C) for 1 h., filtered then hot water (2l) was again added and reheated at (80°C- 85°C) for 1 h. The produced syrup was filtered, concentrated in a boiler with the addition sucrose (0.3%) and citric acid

(0.1%). Then, concentrated by heating at 80°C till 70% T.S.S. was reached. The produced syrup was cooled and kept in glass jars till use.

Sample (5).

One kilogram of Siwi date fruits was soaked in 3 liter hot water, heated at 80°Cfor 1 h., filtered then 2 liter hot water was again added and reboiled for 1 h. The mixture was filtered then 1 liter hot water was added and reboiled for 1 h. The produced syrup was filtered, concentrated in a boiler after the addition of sucrose (0.7) and of citric acid (0.1%), concentrated by heating at 80°C. The concentration process was continued till 70% T.S.S. was attained .The resultant syrup was cooled down and kept in glass jars till use.

Sample (6).

The juice of Siwi fruits was obtained by blending using palmer apparatus. The further steps starting from concentration were reformed as reported in the sample 5.

2. Preparation of mifattaka:-

Half amount of corn oil (50gm) was put in a boiler and heated.The row materials used for mifattaka production (fenugreek seed powder, anoshaa, krtas, haba khdraa, kalkh, ladn, arbic gum, mistaka and kthiraa) and fried. Then dibis (1Kg) was added concentrated . Sesame, peanut , lemon salt and coconut were added, the temperature was increased to boiling, then olive oil (50g) was added and left to cool down. All samples were packed in glass bottles.

3-Chemical analysis:

Moisture, ash, crude fibre, crude proteins and fats were determined as described by A.O.A.C. (2000). Total carbohydrates was obtained by difference. Reducing and total sugars were measured as described by James(1995).Approximate calorific value of date syrup and Mifattaka were calculated using suitable factors i.e., 4 for 1g carbohydrates and proteins and 9 for 1g fats as described by Lawrence (1965). The minerals were determined using the dry ashing method according to the method described by A.O.A.C. (2000). Perkin Elmer Model 4100ZL Atomic absorption spectrophotometer was used for the determination of most minerals. Phosphorus (P) was spectrophotometrically determined according to the method reported by A.O.A.C (2000). Total soluble solids (T.S.S) of fresh date fruits and dibis were determined using Hand Refractometer (ALago Co., Ltd. Tokyo, Japan) as described by Mohamed and Ahmed (1981).

4- Sugar analysis by high- pressure liquid- chromatography (HPLC):

Soluble sugars of date fruits and date syrup [dibis] products were extracted according to method of Black and Bagley(1978) with some modifications as outlined by Knudsen (1986). HPLC-HEWLETT-PACKARD liquid chromatography series 1050, with HEWLETT-PACKARD R.I. detector HP 1047 A and Biorad amimx HPX-87C column 300mmx 7.8mm. was used with part II, and Alltech OA-1000 column 300x 6.5mm. was used in part I and VI. Operating conditions: mobile phase deionized water and auto-degassed in

degasser series:1050, flow rate 0.6ml/min; temperature (70°C); injection volume (5ul).

5- Organoleptic properties:

Organoleptic characteristic scores (taste, color, odor and overall acceptability) were evaluated for date fruits and date syrup products according to the method of Faridi and Rubenthaler(1984). Ten panelists used a numerical basis from one to ten where 9-10 = highly desirable, 7-8 = desirable, 5-6=acceptable, 4 = fair , 2-3 = undersirable and 1 = unacceptable.

6- Statistical analysis:

The collected data of organoleptic properties for dibis and Mifattaka product were statistically analysed by the least significant difference (LDS) at 5% level of probability according to Snedecor and Cochran (1984) .

RESULTS AND DISCUSSION

I- Yield of dibis produced from date fruits:

Table (1) shows the yield of dibis produced from two kinds of fruit dates "Amhaat and unripe and ripe Siwi dates". The highest levels of total soluble solids (T.S.S), based on fresh date fruits, were found in ripe Siwi date fruits 63.6%. It is of interest to note that 650 g date fruits produced 300 g of dibis. T.S.S. were 78.1% for dibis obtained from Amhaat and ripe Siwi date fruits. Previous studies indicated that T.S.S. were ranged between 69.62% to 69.58% (Khalil *et al.*,2002) and between 75.14% to 79.88% (Assous,1999). The unripe Siwi dates had the highest quantity of date residue (505 g from 1.00 Kg) while, ripe Siwi dates had the lowest quantity of date residue [300 g].

Table (1): Yield of dibis produced from different date fruits.

Item	Amhaat		Unripe Siwi		Ripe Siwi	
	Weight	Weight (%)	Weight	Weight (%)	Weight	Weight (%)
Weight of dates (kg)	1.00	100	1.00	100	1.00	100
Pits (g)	127.5	12.75	150	15	116.67	11.67
Pulp (g)	812.5	81.25	825	82.5	650	65
Peels+ waste (g)	60	6.0	50	5.0	233.3	23.33
Date residue (g)	400	40.0	505	50.5	300	30.0
Dibis(g)	200	---	250	---	300	---
T.S.S.* %	28.4	---	34.4	---	63.6	---
T.S.S.** %	78.1	---	76.5	---	78.1	---

Total soluble solids for fresh date fruits
**** Total soluble solids for dibis.**

The present results show that the percentages of flesh pulp and pits were nearly the same for unripe Siwi and Amhaat date fruits and were much higher that of ripe Siwi date fruits. On the contrary, ripe Siwi date fruits had the highest level of peel and west, being about 3.9 and 4.7 times as great as that in Amhaat and unripe Siwi date fruits, respectively. These results were somewhat higher than that obtained by Rizk (2004) who reported that the percentages of flesh pulp and pits and peels weights were 75% and 78%,

13% and 11% and 12% and 11% of Hayany, Seina and valley dates, respectively .

II- Chemical composition of dibis and Mifattaka product:-

Table (2) presents the general chemical composition of date syrup and mollassess. In general, the values of ash and crude proteins for the various date syrups were much higher than that of mollassess. Whilst, the values of fats, crude fiber, total carbohydrates, Ca and Fe in the mollassess were greater than that of various date syrup samples. The dibis from Amhaat date fruits contained the highest level of proteins (1.48%) compared with dibis samples. Also, the dibis obtained by cold extraction had more total carbohydrates and energy that of hot extracted dibis.

Sample No. 6, (extracted from whole fruits) had the highest levels of ash, total carbohydrates, energy, phosphorus, iron and zinc compared with other samples produced by hot extraction. Great variations in ash and protein levels were noticed between the present data and those reported by Al-Hotti *et al* .(2000)

Table (2): Chemical composition of various date syrups " Dibis"*and mollassess based on dry weight

Item	Mollassess	Date syrup sample					
		1	2	3	4	5	6
Moisture (%)	20.28	21.82	21.11	28.36	30.19	30.68	24.15
Crude proteins (%)	0.54	1.48	1.22	1.22	1.01	1.25	0.94
Total fats (%)	1.64	0.30	0.30	0.25	0.30	0.28	0.30
Fiber (%)	0.2	0.01	0.01	0.01	0.01	0.01	0.01
Ash (%)	1.03	1.37	1.63	1.65	1.64	1.69	1.73
Total carbohydrates*(%)	76.31	75.02	75.73	68.51	66.76	66.09	72.87
Energy (Kal / 100 g)	309	309	311	281	274	272	298
Ca (ppm)	142	132	109	119	128	181	126
P (ppm)	4.8	13.3	17.9	13.1	9.3	13.2	16.8
Fe (ppm)	45.6	8.6	14.5	13.6	19.0	32.0	32.1
Zn (ppm)	7.2	7.1	7.6	7.6	7.2	6.2	29.3

*By difference

The data in Table (3) show that Mifattaa produced from dibis had the highest levels of proteins, fats, crude fiber and P compared with the data of mollassess and mifattaka produced from mollasses. On the contrary, Mifattaka processed by dibis contained lower levels of fiber, total carbohydrates, Ca, P, Fe and Zn.

III- Carbohydrate fractions:

Results given in table (4) show the sugar composition for fresh date fruits and their dibis. Ripe Siwi dates were characterized by the highest concentration of reducing sugars, non-reducing sugars and total sugars. Ripe Siwi dates had about 2.5 and 3.4 times as high reducing sugar as that in unripe Siwi and Amhaat dates, respectively. According to the content of reducing sugars in date fruit samples, it can be ranked in the decreasing order: ripe Siwi> unripe Siwi >Amhaat. Ripe Siwi dates had the highest

concentrations of non-reducing sugars and total sugars being about 3.3& 2.7 and 2.6& 2.4 times as great as that in unripe Siwi and Amhaat dates, respectively. Carbohydrate fractions of mollassess were characterized by the high levels of reducing and non-reducing sugars and the total sugar content was about 50% of the carbohydrate fraction of mollasses.

Table (3): Chemical compsoition of Mifattaka based on dry weight

Item	Mifattaka		
	Locally produced	Produced by mollasses	Produced by date syrup
Moisture (%)	18.17	17.02	15.79
Crude proteins (%)	2.78	3.60	4.40
Total fats (%)	18.07	22.88	22.98
Fiber (%)	0.66	0.97	0.78
Ash (%)	1.90	1.74	1.85
Total carbohydrates* (%)	58.42	53.79	52.2
Energy (Kcal)	407	436	433
Ca (ppm)	191	231	153
P (ppm)	15.0	41.1	20.8
Fe (ppm)	115	68.6	25.9
Zn (ppm)	14.4	18.7	12.3

*By difference

Table (4): Carbohydrate fractions of the fresh dates, dibis and mollasses.*

Sample	Carbohydrate fraction		
	Reducing sugars (%)	Non - reducing sugars (%)	Total sugars (%)
A-Fresh dates			
1- Amaaht	1.46	5.05	6.51
2- Unripe Siwi	2.06	4.05	6.11
3- Ripe Siwi	5.09	13.52	15.61
- Control (Mollassess)	19.91	23.18	43.09
B- Dibis:			
- Cold extraction			
1 Amhaat	22.38	11.3	33.68
2 Siwi	10.19	13.13	23.32
- Hot extraction			
3	12.36	12.35	24.71
4	14.24	6.93	21.17
5	13.74	19.3	33.04
6	12.19	35.55	47.74

* On dry weight basis

The results indicate great variations in sugar content according to the different samples as well as the extraction methods. The Amhaat dibis had reducing sugars (22.38%) more than mollassess (19.91%). While, it contained lower levels of both non-reducing sugars and total sugars than those of mollassess.The concentration of sugar fractions were increased by increasing the extraction time and methods. For instance, the sample No. 6,

which obtained by hot extraction, had the highest levels of sugar fractions. These findings might be due to the long of extracting time and heat.

Data presented in table (5) show the sugar fraction levels of mifattaka product. The results show nearly similar concentrations of reducing sugars, non-reducing sugars, total sugars between mifattaka prepared by date syrup and that obtained from local market. The results indicate that local market mifattaka had about 1.8 and 2.2 times as high as a reducing sugar concentration as that in mollassess mifattaka and dibis mifattaka, respectively. mollassess mifattaka was characterized by highest levels of non-reducing sugar and total sugar, being about 2.2, 1.8 and 1.8 , 1.8 times as great as that in local market Mifattaka and dibis mifattaka , respectively. Also, the results show that the non-reducing sugars were present in high amounts in all samples. The mifattaka processed by mollassess had the highest level of total sugars [51.72%].

Table (5): Sugar fractions of Mifattaka products

Sample	Reducing sugars (%)	Non - reducing sugars (%)	Total sugars (%)
Local market mifattaka	6.68	21.62	28.30
Mifattaka + mollassess	3.74	47.98	51.72
Mifattaka + dibis	3.01	26.37	29.38

In contrast, ripe Siwi dates had about 1.9 and 2 times as great of glucose and fructose as that in Amhaat dates, respectively. Both dates of Amhaat and ripe Siwi were devoid of galactose and sorbitol. Ripe Siwi contained higher levels of glucose and fructose than that of unripe Siwi dates, being about 1.9 and 1.9 times as high concentrations as in unripe Siwi dates. However, unripe Siwi dates contained galactose and was not present in ripe Siwi dates.The results in Table (6) show that galacturonic and sorbitol were present in all samples of dibis and control [mollassess] except the dibis processed from Amhaat date.

Table (6): Sugar composition of fresh date and date syrup"Dibis" (g/100g)

Sample	Galacturonic	Sucrose	Glucose	Fructose	Galactose	Sorbitol
A: Fresh dates						
Amahat dates	-----	0.21	18.63	13.70	------	------
Unripe Siwi dates	-----	-----	19.24	14.44	0.09	------
Ripe Siwi dates	-----	0.55	35.19	26.80	-----	-----
B: dibis						
Control"mollassess"	0.79	40.13	34.67	18.14	-----	2.94
Cold extraction samples	-----	0.82	50.45	47.52	-----	2.94
1- Amhat dates	0.48	1.43	52.70	39.62	-----	0.82
2- Siwi dates						
Hot extraction samples						
3-	0.48	2.55	51.95	36.51	----	0.92
4-	0.26	6.19	47.01	33.25	----	1.00
5-	0.65	3.78	49.04	33.86	----	1.03
6-	0.51	2.33	40.08	26.43	----	1.00

It is worth noting that the highest level of sucrose was found in control sample. Glucose occurred in all samples of dibis and its level was generally higher than fructose. The aforesaid sugar composition of dibis was within the data reported by Al-Hooti *et al*,(2002) who found that glucose level was higher than that of fructose in dibis samples. Also, AL-Farsi (2003) reported that glucose level was higher than that of fructose in dibis samples.

Data in Table (7) show the organoleptic characteristic scores for date syrup "dibis". The scoring range values for color, taste, odor and overall acceptability were 7.1-7.9, 6.1-7.7, 6.8-7.5 and 6.4-7.4, respectively. The scoring value for organoleptic characteristics indicate that the samples under study were desirable. The cold extraction method included produced syrup had the highest tast and odor scores than that produced by hot extraction.The lowest level of overall acceptability was found in Siwi dibis which was processed from Siwi date by cold extraction. However, statistical analysis revealed non-significant differences between the hot and cold extraction methods.

Table (7): Organoleptic characteristic scores of date syurp (Dibis)

Sample	Organoleptic characteristic score			
	Color	Taste	Odor	Over all acceptability
A: Cold extraction				
Amahaat dibis	7.6±1.43[a]	7.5±1.18[a]	7.5±0.97[a]	7.2±1.99[a]
Siwi dibis	7.2±1.14[a]	7.7±1.89[a]	7.5±1.72[a]	6.2±0.92[a]
B:Hot extraction				
3	7.9±1.2[a]	6.1±1.2[a]	6.8±0.92[a]	7.4±1.17[a]
4	7.8±1.48[a]	6.6±1.78[a]	7.1±1.37[a]	6.4±1.08[a]
5	7.5±1.58[a]	6.5±1.72[a]	7.5±1.08[a]	7.4±1.43[a]
6	7.1±1.45[a]	6.6±1.85[a]	7.4±1.35[a]	7.3±2.11[a]
L.S.D $_{0.05}$	1.24	1. 42	1.13	1.36

The values in each column followed by the same letter are not significant.

Table (8) shows the organoleptic characteristic scroes of Mifattaka products. The data indicate that there were no significant difference between the samples for color , odor and overall acceptability. While, there was a high significant differences between samples for taste character. Accordingly, the people prefer to consume mifattaka processed by mollassess than that produced from dibis.

Table (8): Organoleptic characteristic scores for Mifattaka product

Sample	Organoleptic characteristic score			
	Color	Taste	Odor	Overall acceptability
Local market mifattaka	8.7±1.16[a]	9.1±0.99[a]	8.4±1.51[a]	8.6±1.27[a]
Mifattaka + mollassess	8.8±1.23 [a]	8.3±1.64[a]	8.2±1.03[a]	8.7±1.25[a]
Mifattaka + dibis	8.2±1.03[a]	7.1±1.2[b]	8.0±1.49[a]	8.2±1.14[a]
L.S.D$_{(0.05)}$	1.05	1.2**	1.25	1.12

**** Highly significant at P=0.05**

The cost of date syrup"dibis":

People usually consume the dates as fresh fruits or jam or semi-dried dates"Agwa" . One has to point out that part of date crop spoil before processing due to its high water content, which encourage the microorganisms to grow. The data in Table (1) show that one kilogram of date fruit produced between 200 to 300 g of dibis. The cost of 1kg fresh date fruits was ranged between 1.00 to 2.00 pounds. Hence, the price of dibis syrup is relatively cheap beside the date residue can be used in food's of low calories-which contain a high fiber content.

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تقييم بعض الطرق لأنتاج عسل البلح

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تهدف هذه الدراسة الى انتاج عسل البلح من نوعين مختلفين من البلح الطازج (بلح الأمهات السيوى) واستخدام طريقيتين للاستخلاص (البارد - الساخن) والمقارنة بينهما وتم فى هذه الدراسة ايضا استبدال عسل المولاس (العسل الأسود) بعسل البلح فى منتج محلى (المفتقة). وتم عمل الأختبارات الكيماوية وتفريد السكريات بواسطة HPLC و أيضا الأختبارات الحسية لكل من عسل البلح والمفتقة فأوضحت النتائج أن كمية العسل المنتجة من البلح السيوى أكبر من البلح الأمهات. كذلك كان الأستخلاص على البارد أعلى من الأستخلاص على الساخن فيمحتوى العسل الناتج من البروتين والكربوهيدرات والطاقة .تبين من تحليل السكرات أن العينات إحتوت على مستوى عال من الجلوكوز عند المقارنة بمحتوها من الفركتوز ،كما أحتوت العينات المنتجة على مستوى قليل من السكروز عند المقارنة بالعينة الحاكمة، أوضحت الأختبارات الحسية أن الأستخلاص على البارد أفضل من نظيره المستخلص على الساخن. وكانت هناك إختلافات معنوية فى طعم عينات المفتقة.