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TECHNOLOGICAL STUDY ON DIBIS EXTRACTION FROM DATE AT THE KHALAL STAGE AND ITS UTILIZATION AS A SUBSTITUTE OF SUGAR IN SOME FOOD PRODUCTS.

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ABSTRACT: ***Date syrup cocnetrate (Dibis) was produced from three date varieties (Samani, Zaghloul and Hayany) in khalal stage. Water extraction method and two concentration methods were used (concentration in an open pans at a temperature ranging between 100 to 105°C at atmospheric conditions and concentration under vacuum at a temperature of 50-60°C) and also extraction, by German method. Physical and chemical characteristics of dibis were determined. Dibis produced by German method was the best in physical, chemical and color characteristics and had a golden color were used in manufacture of cake and strawberry jam at levels 25, 50, 75 and 100% as a sucrose substitute. The products were evaluated for physical, chemical, color and sensory characteristics. The results indicated that samani dibis was the best pertaining color, baking and sensory characteristics when used in the production of both cake and strawberry jam as a substitute of sucrose at 50% level.***

Key words: ***Dibis, Samani, concentration, cake, jam.***

INTRODUCTION

Date palm (phoenix dactylifera L.) is grown in many countries throughout the world, but concentrated mostly in the middle East, North Africa, United States, South Europe and some Asian countries. It is the most successful and important subsistence crop in most of the hot arid desert regions (Botes and Zaid, 1999). It is an important source of nutrients and energy during the Ramadan period (Al-Shahib and Marshal, 2003). Global production of date fruits exceeds 6 million metric tones annually in the world (Boundries *et al.*, 2007). The annual total production of dates in Egypt was 1.600.714 tons (Ministry of Agriculture, 2001). The majority of dates produced in Egypt and other date producing countries are consumed directly as fresh fruits with little or no further processing on commercial scale (Khalil *et al.*, 2002). Dates are considered rich in calories with 80% carbohydrates and relatively low protein content of about 3% (Ahmed *et al.*, 1995). Less than 10% of the date production is processed into several products such as dried product, paste, drink, jam, date combot, Tamrudin (date sheet), glaced date and preserves (Pareek and Godora, 1985, Yousif *et al.*, 1986, Mustafa *et al.*, 1986, Yousif *et al.*, 1987, Barreveld, 1993, Ampratwum, 1998 and Nadir *et al.*, 2005).

Production of date syrup has been investigated by many workers (Nezam El-Din, 1995, Al-Hooti et al., 2002, Khalil et al., 2002, Al-Farsi, 2003, Al-Farsi et al., 2007 and Razavi et al., 2007). Date syrup as a sweetener also contains valuable nutrients. Averaged chemical composition of concentrated date juice (°Brix of 82) was reported as follows: moisture content, 16.5%; protein, 1.45%; glucose 38.2%; fructose, 39.4% and ash, 1.6% (Al-Hooti et al., 2002). Physico-chemical characteristics of dibis were reported by Nezam El-Din (1995), Khalil (1995) and Assous (1999).

Khalil et al., (2002) reported that cake made by substituting 10 and 15% of sugar with dibis scored higher values than the control regarding color, crust, texture, taste, flavor and appearance. However, scores of the quality attributes of cake made by completely substituting sugars with dibis showed lower values by the product was still accepted by panelists.

The main objectives in this work deal with production of high quality dibis with golden color from some local date varieties (Samani, Zaghloul and Hayany) at khalal stage using different methods. The best dibis obtained concerning color and quality was used in the production of both cake and jam as a substitute of sugar at 25, 50, 75 and 100% levels. These products were evaluated for their chemical compostion and organoleptic characteristics.

MATERIALS AND METHODS

Materials

Samani, Zaghloul and Hayany dates in Khalal stage were obtained from local market. The dates were packaged in plastic bags and stored in refrigerator at 5± 1°C until used to dibis extraction. Strawberry (Fragaria Sp.) was obtained at the ripe stage from the local market of Giza, Egypt. Citric acid was obtained from Sigma chemical Co.

Extraction and concentration processes.

Different date varieties were pitted and washed in tap water. Depitted date of each variety was divided into two parts, the first part was extracted by water whereas and the other part was extracted, by the German method according to Nowatzyk (1976) and modified (Ion exchange filtration Anion + cation) by Nadir, (2001) as shown in Fig. 1. For the extraction of dibis by the water method soluble constituents of dates according to the method described by Khalil et al., (2002) was used, samples (250g) of date pulp were transferred into a glass beakers and thoroughly mixed with 500 ml of water. The beakers were placed in a water bath adjust to 70-oC and kept for 3hr. with maintaining a continuous stirring over the extraction period. The mixture was transferred to a piece of fine cheese cloth and pressed by hand to recover the extracts as completely as possible. The extraction was continued to cover all the varieties and to be able to obtain sufficient quantites of different extracts and which were divided into two portions. The first portion was concentrated under atmospheric pressure using hot plate and open pan in which the extracts were boiled until it reached of

68-70°Brix. The other portion was concentrated under vacuum with rotary evaporator model (Heidolph WB 2000) to get dibis of 68-70°Brix.

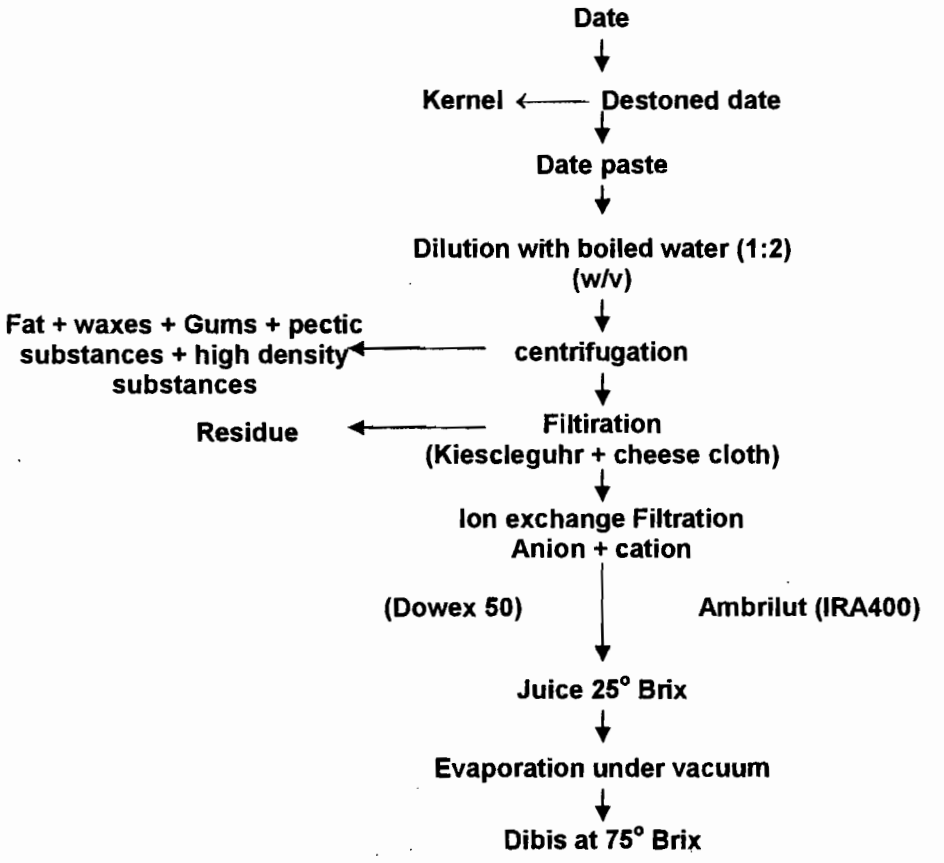

Fig. (1) Flow diagram for Dibis production by German method and modified by Nadir (2001).

The different samples of dibis were kept in brown glass bottles and stored in refrigerator at 5 ± 1°C until required.

Cake preparation

The cake formulations used in this study were adapted from the work of Pyler (1973). Cakes were prepared containing 25, 50, 75 and 100% of different forms of dibis as a sugar replacement. Batter was poured into pans and baked in an electric oven for 25 min. at 175°C.

Cake properties

The cake volume was measured by rape seed displacement method (Bennion and Bamford, 1973). The cake was weight after one hour of baking and specific volume (Cm^3/g) was estimated. Total volume index was calculated by averaging the standing hight (in Cm) of the five points on the cake, measured with a vernier caliper: at the four corners 1cm from each edge, and the geometric centre. Bulk density (gm/Cm^3) were also measured.

Jam preparation

Strawberry fruits were washed, separated from its calex and weighed. One of the test jams were sweetened with sucrose (as control) and the others were sweetened with 25, 50, 75 and 100% of different forms of dibis as a sugar replacement. The test jams were cooked in an open kettle for 10 min after boiling, since this time was sufficient to reach the required 68% total soluble solids in the sample containing the fruit, sucrose (as control) and citric acid was also added. Jam prepared from each sample was packed while hot in glass jars of 250g capacity and immediately closed. Samples were stored at room temperature until analyzed.

Analytical methods

Moisture, protein, fat, fiber, ash, total sugars, reducing sugars, total solids and total acidity contents were determined according to the A.O.A.C. methods (1995). Non-reducing sugars were determined by differences between total sugars and reducing sugars. Total carbohydrates were calculated by difference. The pH of different samples was measured using a digital pH-meter (HANNA, H1902 m Germany.), whereas polyphenols were determined according to Maier and Metzer (1965).

Browning index was determined according to Ranganna (1986) and the results were expressed as absorbance values (A at 420 nm). Clarity was determined as described by Endo (1965) and results were expressed as transmittance value (% T at 660 nm). Viscosity was measured using Ostwald capillary tube and the values were expressed as flow time (min) at 25°C as described by Ranganna (1986).

Mineral contents were determined by digestion of samples with sulphuric acid. (5ml) and perchloric acid. (0.3ml) according to the method of Pearson (1976) and using Perkin Elmer 2380, Atomic Absorption Spectrophotometer according to the method of A.O.A.C. (1995).

Color evaluation

Color differences of cake and jam samples were measured by using a Spectro-Colorimeter (Tristimulus color machine) with C|E lab color scale (hunter, Lab scan XE, Reston VA.) calibrated with a white standard tile of Hunter lab color standard (LXNO. 16379): X = 77.26, Y = 81.94 and Z= 88.14 (L^*=92.65, a^* = -0.86, b^* = -0.16). Color difference (ΔE) was calculated from a, b and L parameters, using Hunter-Scotfield's equation (Hunter, 1975) as follows:

$$\Delta E = (\Delta a^2 + \Delta b^2 + \Delta L^2)^{\frac{1}{2}}$$

Where a=a-a°., b = b-b° and L = L - L°.

Subscript "O" indicates color of the control. Hue angle (tg^{-1} b/a) and saturation index $\left[\sqrt{a^2 + b^2}\right]$ were also calculated.

Sensory evaluation

Sensory evaluation of different dibis samples was done by a ten semi-trained panelists from the staff of the Food Technology Research Department, National Research Centre according to the method described by Mustafa et al., (1983). Dibis samples were evaluated for taste, flavor and color. Cake samples were evaluated for color, taste, flavor, texture and tenderness according to the method described by Bennion and Bamford (1973). Different samples of jam were evaluated organoliptically for color, texture, taste and preference after preparation by the same ten semi-trained panelists according to the method described by Hyvonen and Torma (1983).

Statistical analysis:

The results were statistically analyzed by the analysis of variance and least significant difference (L.S.D.) at 0.05 level according to the method described by Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

Data in Table (1), show that, total solids and total soluble solids were high in all dibis samples for all date varieties extracted either by German method or dibis samples extracted with water method and concentrated under either atmospheric or under vacuum conditions. Total sugars were the main compounds in the chemical composition of dibis. The content of total sugars for dibis samples extracted with German method was the highest than other samples extracted with water method. The highest values of total solids, total soluble solids, total sugars and non-reducing sugars were occurred in samani dibis sample extracted by german method. Reducing and non-reducing sugars contents were increased in all dibis samples extracted with German method while, these contents were lowered in water extracted dibis samples. Results also indicated that reducing and total sugars of samples concentrated at atmospheric conditions were lower than samples concentrated under vacuum. These results could be due to the contribution of reducing sugars in Maillard reactions, which might have occurred at accelerated rates at high temperatures during concentration at atmospheric conditions (Khalil et al., 2002).

All chemical composition of different dibis samples which included total solids, total soluble solids, total sugars, acidity and pH were within the limits of Egyptian Standards (1996) for dibis. These results are in agreement with those obtained by Assous (1999) and Khalil et al., (2002).

Table (1): Physico-Chemical characteristics of different dibis samples extracted and concentrated from different date varieties by several methods. (on dry weight basis).

Characteristics	Samani dibis extracted by			Zaghloul dibis extracted by			Hayany dibis extracted by		
	Water method (1:2) (w/v)			Water method (1:2) (w/v)			Water method (1:2) (w/v)		
	Concentrated under atmospheric condition	Concentrated under vacuum	German method	Concentrated under atmospheric condition	Concentrated under vacuum	German method	Concentrated under atmospheric condition	Concentrated under vacuum	German method
Total solids (%)	82.63	83.25	83.78	81.65	82.92	83.85	80.94	81.83	82.86
Total soluble solids (Brix)	69.60	68.40	74.86	69.72	68.65	74.92	69.48	67.94	74.64
Total sugars	80.07	81.41	82.88	80.85	82.28	83.80	76.30	77.74	79.28
Reducing sugars (%)	75.72	77.08	78.36	76.92	78.30	79.60	72.21	73.50	74.81
Non-reducing sugars (%)	4.35	4.33	4.52	3.93	3.98	4.20	4.09	4.24	4.47
Acidity (as acetic acid, %)	0.46	0.31	0.25	0.52	0.36	0.29	0.55	0.40	0.32
pH	7.41	7.34	7.28	6.90	6.81	6.72	7.21	7.07	6.95
Polyphenols (%)	0.39	0.34	0.22	0.45	0.37	0.24	0.49	0.40	0.28
Ash (%)	3.15	2.94	2.71	2.24	1.91	1.78	2.19	1.83	1.67
Browning index (A at 420 nm)	0.83	0.54	0.10	0.87	0.57	0.12	0.90	0.60	0.24
Clarity (% T at 660nm)	69.35	78.20	92.16	68.29	75.80	89.54	66.76	74.60	87.31
Viscosity (flow time, sec).	13.24	12.65	11.80	13.45	12.83	12.15	13.74	12.95	12.35

There was a variation in browning index values between the different dibis samples. The concentration under atomospheric conditions caused darker color with browning index values ranged from 0.83 to 0.90. This effect may be due to the high evaporation temperature (100-105°C) which acclerated rate of browning reactions, consequently more brown compounds accumulated and the color of obtained dibis became darker (Nezam El-Din, 1995) Browning index values of dibis samples extracted with water method and concentrated under vacuum were 0.54-0.60. These values were lower than dibis samples concentrated under atmospheric conditions and may be due to the effect of vacuum during the concentration of dibis samples which reduced the rate of browning reactions. In dibis samples extracted with German method, Ion exchange step may be responsible to released the browning color of dibis sample and therefore a golden color was obtained. Sample of samani dibis extracted by German method was the best in Browning index, clarity and viscosity values.

Dibis samples obtained from water extraction method were highly turbid with a clarity values of 66.76-78.20%, while samples prepared from German method showed a clarity values of 87.31-92.16% due to separation of pectic substances during extraction which affect also in decreasing the viscosity of the dibis (Nowatzyk, 1976).

Mineral analysis of different dibis samples extracted by German method are tabulated in Table (2). It could be noticed that dibis was rich in the most important elements. It contained a high levels of potassium, phosphorus, calcium, magnesium and sodium. Samani dibis had higher content of all minerals than that of other types of dibis (Zaghloul and Hayany dibis). Potassium was the major element in the obtained results. These results are in agreement with those obtained by Khalil et al. (2002).

Table (2): Minerals content of different dibis samples extracted by German method from different date varieties (mg/100g dry weight basis).

Elements	Samani dibis	Zaghloul dibis	Hayany dibis
Sodium	62.36	58.69	60.83
Potassium	1881.25	1657.40	1741.25
Calcium	153.49	150.38	151.62
Phosphorus	179.30	173.27	176.59
Magnesium	129.61	118.81	120.38
Iron	2.85	2.76	2.79
Copper	1.26	1.19	1.21
Zinc	1.33	1.26	1.30
Manganese	1.60	1.52	1.56

Hunter color values of different dibis samples extracted and concentrated from different date varieties by several methods are given in Table (3). The results indicate that, samples of dibis prepared by German method from different date varieties had higher (L) lightness and (b) yellowness values

than the other dibis samples which were concentrated either under atmospheric condition or under vacuum. High values of (L) lightness and (b) yellowness in Samani dibis prepared by German method than the other types of dibis extracted from date varieties (Zaghloul and Hayany date) prepared by the same method were noticed. Also, the highest values of saturation and hue were observed in samani dibis prepared by German method. This effect might be due to the extraction conditions of dibis with filtration and ionexchange steps by German method which captured the compounds responsible for color solution and became clarified (Nowatzyk, 1976). On the other hand, Hunter color values of dibis for all dibis samples evaporated under atmospheric conditions was lower in (L) lightness, (b) yellowness and higher in (a) redness than the other dibis samples. This results should be mainly due to the darker color of dibis samples prepared by evaporation at atmospheric conditions at high temperature (100-105°C) which accelerated the rate of browning reactions such as hydroxymethyl furfural which could be produced from Maillard reaction and thermal degradation of reducing sugar (Mohamed and Ahmed, 1981). These results agreed with Assous (1999) and Khalil et al., (2002).

Table (3): Hunter color values of different dibis samples extracted and concentrated from different date varieties by several methods.

Dibis samples	L	a	b	a/b	Saturation	Hue
Samani dibis (concentrated under atmospheric conditions).	7.70	40.95	46.91	0.87	62.27	48.88
Samani dibis (concentrated under vacuum).	11.24	31.40	65.37	0.48	72.52	64.34
Samani dibis (German method).	27.63	21.50	79.62	0.27	82.47	74.89
Zaghloul dibis (concentrated under atmospheric conditions).	6.51	76.15	27.18	2.80	80.86	19.64
Zaghloul dibis (concentrated under vacuum).	9.39	58.36	39.12	1.49	70.26	33.83
Zaghloul dibis (German method).	23.48	30.29	50.83	0.60	59.17	59.21
Hayany dibis (concentrated under atmospheric conditions).	5.20	72.80	24.57	2.96	76.83	18.65
Hayany dibis (concentrated under vacuum).	8.68	55.24	35.91	1.54	65.89	33.03
Hayany dibis (German method).	22.76	38.32	44.75	0.86	58.92	49.43

* L = lightness
* a = redness
* b = yellowness
* a/b= redness / yellowness

Sensory evaluation of different dibis samples was statistically analyzed in Table (4). Results show that all dibis samples from different varieties (Samani, Zahgloul and Hayany) prepared by German method were the highest in score values among the dibis samples investigated. Samani dibis was the best in taste, color and flavor when compared with other types of dibis

prepared by the same method (German method). There was a significant differences in taste, color and flavor between all types of dibis samples prepared by water method and concentrated at atmospheric conditions or under vacuum. Sensory results of other dibis samples (prepared by German method) for all varieties showed no significant differences between them in all tested sensory characteristics. Therefore, Samani, Zaghloul and Hayany dibis samples prepared by German method were used in this research as a sugar replacement at levels 25, 50, 75 and 100% to manufacture cake and strawberry jam.

Table (4): Sensory evaluation of different dibis samples.

Dibis samples	Taste	Color	Flavor	Total
Samani dibis (concentrated under atmospheric conditions).	5.43^{C}	5.51^{C}	5.37^{C}	16.31
Samani dibis (concentrated under vacuum).	7.72^{B}	7.53^{B}	6.50^{B}	21.75
Samani dibis (German method)	9.65^{A}	9.20^{B}	8.32^{B}	27.17
Zaghloul dibis (concentrated under atmospheric conditions).	5.10^{C}	5.29^{C}	5.13^{CD}	15.52
Zaghloul dibis (concentrated under vacuum).	7.47^{B}	7.40^{B}	6.24^{B}	21.11
Zaghloul dibis (German method)	9.36^{A}	8.85^{A}	7.70^{A}	25.91
Hayany dibis (concentrated under atmospheric conditions).	4.81^{CD}	4.72^{CD}	4.64^{CD}	14.17
Hayany dibis (concentrated under vacuum).	7.25^{B}	6.94^{BC}	5.81^{BC}	20.00
Hayany dibis (German method)	9.17^{A}	8.61^{A}	7.46^{A}	25.24
L.S.D. $_{0.05}$	1.89	1.67	1.02	

Hunter color values of cake samples contained different levels of dibis extracted from different varieties are presented in Table (5). Results show that (L) lightness values of cake samples replaced with different levels of dibis were decreased as compared with that of control. Generally this reduction increased with the increasing of dibis replacement level. Samples of cake contained samani dibis were the lowest in the reduction rate of (L) lightness values while, cake samples replaced with Hayany dibis at all levels were the highest for the same effect among the cake samples investigated. All cake samples replaced with zaghloul dibis had higher values of (b) yellowness while, (a) redness values were higher in samples of cake contained samani dibis than the control. This effect was noticed at all levels

of dibis replacement. Highest a/b values was found at replacement levels 75 and 100% with Hayany dibis. All cake samples replaced with dibis had high values of saturation and low values of hue as compared with control. Zaghloul dibis replacement at all levels tend to increase the saturation values of cake samples to the highest values when compared with other replaced cake samples. The great change in color difference (ΔE) was found in cake sample contained 100% Zaghloul dibis (82.80). the least effect on ΔE values noticed in cake samples replaced with samani dibis at different replacement levels compared with other different replacement of dibis.

Table (5): Hunter color values of cake samples made with different dibis samples at different levels.

Cake Samples	L	a	b	a/b	Saturation	Hue	ΔE^*
Control	48.67	16.20	35.72	0.45	39.22	65.60	-
Cake replaced with Samani dibis at levels:							
25%	40.55	31.10	47.46	0.66	56.74	56.76	20.63
50%	30.82	45.07	58.39	0.77	73.76	52.34	40.81
75%	19.41	56.36	67.15	0.84	87.67	49.99	58.79
100%	12.75	67.89	78.23	0.87	103.58	49.05	75.96
Cake replaced with zaghloul dibis at levels:							
25%	32.64	42.07	40.61	1.04	58.47	43.99	30.82
50%	25.20	55.98	52.23	1.07	76.56	43.02	49.05
75%	15.36	67.64	60.81	1.11	90.96	41.96	66.22
100%	9.90	79.87	71.76	1.11	107.37	41.94	82.80
Cake replaced with Hayany dibis at levels:							
25%	26.90	39.46	38.30	1.03	54.99	44.15	31.96
50%	19.55	50.12	46.92	1.07	68.65	43.11	46.09
75%	13.96	62.80	51.43	1.22	81.17	39.32	60.19
100%	7.53	74.39	64.25	1.16	98.30	40.82	76.76

* L = lightness
* a = redness
* b = yellowness
* a/b= redness / yellowness
* Color difference

Hunter color values (L, a and b) of strawberry jam samples prepared with different levels of dibis extracted from samani, zaghloul and Hayany date are presented in Table (6). The results show that, replacement of sugar with date dibis at different levels reduced (L) lightness and increased (a) redness and (b) yellowness compared with those of control. This effect was general and included all levels of replacement. These results may be due to the golden color appeared in color characteristics of different types of dibis as a result of extraction conditions by German method. The lowest values of (L)

lightness and the highest values of (a) redness and b (yellowness) were found in strawberry jam samples contained Hayany dibis at all replacement levels. Saturation values were the highest in jam samples contained samani dibis among the jam samples investigated. The effect of replacement for strawberry jam with different date dibis at different levels was clear when color difference (ΔE) values were calculated. It was high when strawberry jam contained 100% Hayany dibis and low in jam sample contained 25% samani dibis.

Table (6): Hunter color values of strawberry jam samples made with different dibis samples at different levels.

Jam Samples	L	a	b	a/b	Saturation	Hue	ΔE^*
Control	52.38	12.49	26.15	0.48	29.98	64.47	-
Jam replaced with Samani dibis at levels:							
25%	47.12	16.53	29.78	0.56	34.06	60.97	7.56
50%	41.56	19.70	31.26	0.63	36.95	57.78	13.97
75%	38.29	24.68	35.42	0.70	43.17	55.13	20.81
100%	35.67	28.45	38.71	0.73	48.04	53.69	26.30
Jam replaced with zaghloul dibis at levels:							
25%	45.60	15.71	28.52	0.55	32.56	61.15	7.87
50%	40.37	18.89	30.41	0.62	35.80	58.15	14.26
75%	37.92	23.45	34.16	0.69	41.43	55.53	19.83
100%	34.12	27.63	37.49	0.74	46.57	53.61	26.29
Jam replaced with Hayany dibis at levels:							
25%	43.72	14.96	27.60	0.54	31.39	61.64	9.12
50%	39.67	17.38	29.52	0.59	34.26	59.51	14.03
75%	35.84	22.49	33.75	0.67	40.56	56.32	20.77
100%	32.40	26.58	36.11	0.74	44.84	53.64	26.40

* color difference

Results in Table (7) show that, cake samples contained different date dibis at all levels of replacement had lower values of volume than the control. The same trend was observed in results of weight for cake samples except at

replacement levels 25 and 50% with samani dibis and 50% for both cake samples replaced with zaghloul and Hayany dibis. Total volume index of all replaced cake samples were decreased with increasing the replacement level until reached to 75% replacement level compared to those of control. There was no great change in results of specific volume and bulk density for different cake samples and control. The present results are in agreement with the results reported by Mustafa et al., (1983), Al-Zubaydi et al., (1983) and yousif et al. (1984).

Table (7): Baking quality of cake samples as a result of using different dibis samples at different levels.

Cake Samples	Volume (Cm^3)	Weight (gm)	Total volume index	Specific volume (cm^3/gm)	Bulk density (gm/Cm^3)
Control	258	92	26.13	2.80	0.36
Cake replaced with Samani dibis at levels:					
25%	246	94	24.97	2.62	0.38
50%	250	97	23.60	2.58	0.39
75%	248	90	25.69	2.76	0.36
100%	247	89	28.07	2.78	0.36
Cake replaced with zaghloul dibis at levels:					
25%	244	90	22.81	2.71	0.37
50%	247	93	21.42	2.66	0.38
75%	241	86	23.54	2.80	0.36
100%	240	85	26.75	2.82	0.35
Cake replaced with Hayany dibis at levels:					
25%	241	87	21.24	2.77	0.36
50%	243	90	20.09	2.70	0.37
75%	240	85	21.68	2.82	0.35
100%	235	84	26.80	2.80	0.36

Results in Table (8) reveal that, ash and total carbohydrates contents of cake samples at different replacement levels with samani, zaghloul and Hayany dibis were higher than that of the control. The highest ash values occurred in cake samples replaced with samani dibis while, samples of cake contained Hayany dibis contained high values of total carbohydrates. All

other chemical components of cake samples with different dibis replacement were decreased compared with those of control. This effect was clear at all dibis replacement levels. These results are in agreement with those obtained by Ainji et al., (1988) and Khalil et al., (2002).

Table (8): Chemical composition of cake samples contained different dibis samples at different levels.

Components %	Control	Cake samples replaced with Samani dibis at levels:				Cake samples replaced with Zaghloul dibis at levels:				Cake samples replaced with Hayany dibis at levels:			
		25%	50%	75%	100%	25%	50%	75%	100%	25%	50%	75%	100%
Protein	11.16	9.15	8.89	8.41	7.90	9.38	9.17	8.73	8.14	9.47	9.22	8.86	8.25
Fat	21.67	18.96	15.48	12.87	8.62	18.73	15.26	12.59	8.35	18.60	15.12	12.37	8.19
Ash	1.95	2.61	2.82	3.10	3.46	2.54	2.73	2.94	3.30	2.49	2.67	2.83	3.21
Crude Fiber	1.52	1.36	1.17	1.03	0.92	1.25	1.08	0.94	0.86	1.20	0.97	0.88	0.79
Total carbohydrates	63.70	67.92	71.64	74.59	79.10	68.10	71.76	74.80	79.35	68.24	72.02	75.06	79.56

Results in Table (9) indicate that, with increase the replacement level of sucrose with dibis generally caused a reduction in TS% values and increased all other values of physicochemical characteristics from the control. Strawberry jam samples contained Hayany dibis were more lower in TS% values and jam samples contained Zaghloul dibis were higher in TSS%, total acidity%, reducing sugar (R.S)%, non reducing sugar (N.R.S)% and protein values than the other jam samples contained Samani and Hayany dibises. The highest values of pH and viscosity were obtained in jam samples contained samani dibis. These results are in agreement with those obtained by Mustafa et al., (1986) and Khalil et al., (1995).

Sensory evaluation of cake samples replaced with different levels of dibis from different date varieties was statistically analyzed in Table (10). There was no significant differences in all sensory characteristics between samples of cake replaced with 25 and 50% dibis obtained from different date varieties. The addition of dibis at the last percentages to the cake samples tended to increase the total score of cake samples compared to the control. This effect was observed generally in all cake samples contained 25 and 50% of dibis obtained from different date varieties. The highest score was found in cake sample replaced with 50% Samani dibis (46.38). Lower score values of all sensory characteristics were obtained in all cake samples contained dibis extracted from all date varieties at levels 75 and 100%. No significant differences were found in all measured sensory characteristics in cake samples replaced with 75% of dibis extracted from all date varieties. Meanwhile, samples of cake replaced with 100% Zaghloul and Hayany dibis had no significant differences in color, taste, texture and tenderness between them.

Table (9): Physicochemical characteristics of strawberry jam samples replaced with different dibis samples at different levels.

Jam Samples	Total solids (TS)%	Total soluble solids (TSS)%	Total acidity (as acetic acid)%	pH value	Reducing sugar % (R.S)	Non-reducing sugar (N.R.S) %	Protein %	Viscosity
Control	68.41	67.50	0.94	3.60	39.86	4.25	0.82	141
Jam replaced with Samani dibis at levels:								
25%	67.91	67.68	1.18	4.10	41.72	5.48	1.04	156
50%	67.75	67.85	1.25	4.30	44.60	5.97	1.10	162
75%	67.58	68.32	1.36	4.50	46.53	6.62	1.19	167
100%	67.29	68.69	1.42	4.70	48.70	7.11	1.23	174
Jam replaced with zaghloul dibis at levels:								
25%	68.12	67.79	1.25	3.90	41.97	5.63	1.10	153
50%	67.88	67.96	1.36	4.10	44.82	6.19	1.18	159
75%	67.69	68.45	1.42	4.30	46.71	6.78	1.23	164
100%	67.36	68.72	1.53	4.50	48.90	7.25	1.27	171
Jam replaced with Hayany dibis at levels:								
25%	67.73	67.63	1.20	3.80	41.83	5.59	1.06	151
50%	67.52	67.74	1.28	4.00	45.12	6.15	1.12	156
75%	67.39	68.25	1.32	4.40	47.06	6.69	1.16	160
100%	66.81	68.53	1.40	4.60	48.67	7.20	1.20	167

Table (10): Sensory characteristics of cake samples made with different dibis samples at different levels.

Cake Samples	Color	Taste	Flavor	Texture	Tenderness	Total
Control	8.25^{AB}	8.48^{AB}	9.00^{AB}	8.37^{AB}	8.60^{AB}	42.70
Cake replaced with Samani dibis at levels:						
25%	8.52^{A}	8.87^{A}	9.36^{A}	8.90^{A}	9.13^{A}	44.78
50%	8.74^{A}	9.21^{A}	9.68^{A}	9.25^{A}	9.50^{A}	46.38
75%	6.60^{BC}	7.62^{B}	7.20^{BC}	6.84^{BC}	6.71^{CD}	37.97
100%	5.43^{C}	6.50^{BC}	6.31^{CD}	5.72^{C}	5.54^{D}	29.50
Cake replaced with zaghloul dibis at levels:						
25%	8.46^{A}	8.79^{A}	9.27^{A}	8.75^{A}	8.92^{A}	44.19
50%	8.65^{A}	9.15^{A}	9.59^{A}	9.14^{A}	9.38^{A}	45.91
75%	6.14^{BC}	7.21^{BC}	6.75^{BC}	6.29^{BC}	6.30^{CD}	32.69
100%	5.20^{CD}	5.86^{CD}	5.72^{CD}	5.10^{CD}	5.00^{D}	26.88
Cake replaced with Hayany dibis at levels:						
25%	8.37^{A}	8.66^{A}	9.18^{A}	8.67^{A}	8.84^{A}	43.72
50%	8.58^{A}	9.00^{A}	9.43^{A}	9.03^{A}	9.29^{A}	45.33
75%	5.59^{C}	6.36^{BC}	5.64^{CD}	5.80^{CD}	5.71^{D}	29.10
100%	4.78^{CD}	5.10^{CD}	5.21^{D}	4.62^{D}	4.56^{E}	24.27
LSD $_{0.05}$	1.53	1.59	1.48	1.45	1.17	

Data Table (11) represent the mean scores for sensory characteristics of strawberry jam samples contained different levels of dibis extracted from different date varieties. The control sample recorded the highest score for all sensory characteristics (39.20). The other strawberry jam samples contained different types of dibis extracted from Samani, Zaghloul and Hayany date as a sucrose replacement at levels 25 to 100% recorded score values ranged between 21.39 – 38.79. At 50% samani dibis replacement, strawberry jam sample was the nearest in all sensory characteristics to the control and had no significant differences between them. The other replacement levels (75 and 100%) with all dibis types caused a great reduction in score values compared to the control and noticed a significant differences between them in color, taste, texture and preference.

Table (11): Sensory characteristics of strawberry jam samples made with different dibis samples at different levels.

Jam Samples	Color	Taste	Texture	Preference	Total
Control	9.92^{A}	9.87^{A}	9.76^{A}	9.65^{A}	39.20
Jam replaced with samanidibis at levels:					
25%	9.75^{A}	9.77^{A}	9.67^{A}	9.60^{A}	38.79
50%	8.84^{AB}	8.60^{AB}	8.52^{AB}	8.75^{AB}	34.71
75%	7.63^{BC}	7.46^{BC}	7.19^{C}	7.38^{BC}	29.66
100%	6.40^{CD}	7.00^{C}	6.31^{CD}	6.42^{D}	26.13
Jam replaced with zaghloul dibis at level:					
25%	8.59^{B}	8.82^{AB}	8.61^{AB}	8.74^{AB}	34.76
50%	7.72^{BC}	7.40^{BC}	7.35^{BC}	7.63^{AB}	30.10
75%	6.80^{CD}	6.71^{CD}	6.50^{CD}	6.89^{BC}	26.90
100%	5.63^{D}	6.47^{CD}	5.69^{D}	5.76^{DE}	23.55
Cake replaced with Hayany dibis at levels:					
25%	7.70^{BC}	7.64^{BC}	7.92^{BC}	7.58^{BC}	30.84
50%	7.18^{C}	6.93^{CD}	6.81^{CD}	6.60^{CD}	27.52
75%	6.23^{DE}	6.07^{CD}	5.64^{DE}	6.33^{DE}	24.27
100%	5.10^{E}	5.82^{DE}	5.28^{DE}	5.19^{E}	21.39
LSD $_{0.05}$	1.15	1.29	1.28	1.05	

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دراسة تكنولوجية على أستخلاص الدبس من البلح في مرحلة الخلال واستخدامه كبديل للسكر في بعض المنتجات الغذائية

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الملخص العربي

الهدف من البحث هو دراسة تأثير استخدام طرق مختلفة لإنتاج دبس ذو لون ذهبي من أصناف البلح في مرحلة الخلال (سماني، زغلول، حياتي) حيث تم استخدام الطريقة المائية للاستخلاص و٢ طريقة للتركيز تحت ظروف مختلفة وهي التركيز في أواني مفتوحة تحت الضغط الجوي العادي والتركيز تحت التفريغ وأيضاً الاستخلاص بالطريقة الألمانية وتم تقدير الصفات الطبيعية والكيماوية للدبس وقد أوضحت النتائج أن أفضل أنواع الدبس هو المنتج بالطريقة الألمانية من حيث الصفات الطبيعية والكيماوية واللون وقد تم استخدام الدبس الناتج ذو اللون الذهبي في إنتاج الكيك والمربى بنسب مختلفة ٢٥، ٥٠، ٧٥، ١٠٠% كبديل للسكروز.

وقد أظهرت نتائج تقييم المنتجات طبيعيا وكيماوياً ولونياً وكذلك حسيا أن دبس السماني كان الأفضل في إنتاج الكيك والمربى عند استخدامه كبديل للسكر بنسبة ٥٠% من حيث اللون وصفات الخبيز وكذلك الصفات الحسية.