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CHEMICAL, PHYSICAL AND SENSORY EVALUATION OF BISCUIT SUPPLEMENTED WITH DATE POWDER.

Mohamed, A. Kenawi[1]; Fawzy, A. H. El Sokkary[1]; Mohamed, N. Kenawi[1], Mostafa, T. M. Assous[2], and Zeinab, A. H. Abd El galil[2]

[1] Dept. Food Science. Fac. of Agric. Minia Univ.
[2] Food Technology Research Institute, Agricultural Research Center.

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ABSTRACT

The effects of date powders of El Sakkoti and Tamr El wadi as a sugar substitution on the sensory attributes, physical properties, chemical composition, mineral contents and the microbial analyses of biscuits were studied. Sensory evaluation results indicated that biscuit supplemented with 30% date powder was acceptable preference. A decrease of the specific volume and density and an increase in the hardness were noticed with increasing the levels of date powders supplementation. The chemical components results of the date powder supplemented biscuits indicated an increase in the moisture content, starch, ash, fiber, and minerals content compared with control. This increment in the minerals content could be due to the addition of date powders which having high contents of minerals. There were no remarkable effects in the microbial analyses as a result of the supplementation when supplemented biscuits were compared with the control one.

Key words: date powder, biscuits, and supplementation.

INTRODUCTION

Dates, the staple food of the Middle East countries are considered as sweet fruit. Date palms produce clusters of oval, dark, reddish-brown drupes called dates, below their fronds. Dates are loaded with various nutrients, right from minerals like calcium, potassium, magnesium, etc. to vitamins like vitamins A, B complex, and C, etc.. Moreover, dates are low in fat and high in protein and fiber content, which makes them healthy snacks between meals. Date fruits have been considered very important in the Islamic culture. Muslims are seen to break their fasting by consuming dates. This is because

after fasting the body requires an energy-boosting food item, and dates suit this part perfectly. Most of the produced dates are used directly for human consumption with little or no further processing. Recently, the date producing countries gave some attention to the improvement and development of date processing. New date packing and processing plants are being established and new products such as date syrup, vinegar, alcohol, liquid sugar, jelly, date paste and date powder are successfully marketed, a small amount of the produce is processed (Yousif *et al*. 1987).The partial replacement of wheat flour by date paste at the level 4% produced bread superior to control bread in most physical measures (Youssef *et al.*, 1991).

Sulieman *et al*., (2011) used date powder at 5% and 10% replacement levels of wheat flour for production of biscuits. The sensory evaluation of the different biscuit samples revealed that there were no significant differences between biscuit made from the different blends of wheat flour and date powder. However, panelists gave higher scores to the 5% date powder (agwa) than the biscuit made from other blends. Azouz, (2011a and b) produced children Egyptian school meal within Egyptian school feeding project, Ministry of Agriculture and Land Reclamation .He prepared five meals made from (A, B, C, D and E) formulas contained margarine, yellow butter or their blends as a source of fat content with 20% minced date paste (agwa) and he found that the prepared formula C which contains 1:1 butter and margarine was contained a complementary amino acid profiles, minerals and vitamins it was the best, suitable and healthier one for Egyptian school children aged between 6 and 12 years. Adiba *et al*., (2011) produced food tablets from date powder and /or spirulina powder which could be of various uses: *i.e*. (1) consumption as such by all categories of consumers, (2) feeding of patients for whom it is difficult to chew or swallow food, knowing that these tablets can be either sucked or swallowed, and (3) as possible natural and cheap drug delivery carriers.

MATERIAL AND METHODS

1. MATERIALS:

Date palm fruits (*Phoenix dactylifera* L.) of Tamr El wadi and El Sakkoti varieties at tamr stage were obtained from New Valley Governorate, Egypt in November 2013.

Flour, sugar, shortening, milk powder, high fructose (42 E.D.), ammonium bicarbonate, sodium bicarbonate and eggs (whole and fresh) were purchased from local market, Giza, Egypt.

Bioxial oriented polypropylene metalized (BOPPM) 20/20 micron was obtained from Food Engineering and Packaging dept., Food Technology Research Institute, Egypt to package biscuit.

Nutrient and malt agar for microbiological evaluation were obtained from Biolife Co., Italy.

2. METHODS

1. Production of date powder

El Sakkoti and Tamr El wadi varieties were cooled, minced, crushed with mixer (K45SS, 250 W, Kitchen Aid, Inc., MI) and mixed with 20% of starch. The mixture was then dried till constant weight with oven drying at 70°C ± 3°C.

2. Biscuit processing

Hard sweet biscuit was prepared by partially replacement of the sucrose with 10%, 20%, 30 %, 40% and 50% for the selected treatments of date powders. The recipe of the prepared biscuit was carried out according to the method of Gamal *et al.,* (2012) with some modification as Shown in Table:

Table (1): Ingredients of biscuits

Ingredients (gm)	Replacing the sucrose with date powder					
	control	10%	20%	30%	40%	50%
Flour (soft, 72%)	350	350	350	350	350	350
Sugar	115	103.5	92	80.5	69	57.5
Date powder	-	11.5	23	34.5	46	57.5
Shortening	50	50	50	50	50	50
milk powder	5	5	5	5	5	5
High fructose (42 E.D.)	10	10	10	10	10	10
Ammonium bicarbonate	5.5	5.5	5.5	5.5	5.5	5.5
Sodium bicarbonate	2	2	2	2	2	2
Egg (whole, fresh)	65	65	65	65	65	65
Vanillin	0.04	0.04	0.04	0.04	0.04	0.04
Water	As require					

The sugar and shortening were creamed in the mixer for 2min., whole egg and vanillin were blended for 2 min. Flour and baking powder were mixed and added, the mixture was gently mixed for 5 min by using a wooden rolling pin. The percentage of the date powder (10 -50%) was cut from the percentage of the sugar in the biscuits formula. Water was added as require. The dough was sheeted to a uniform thickness of 4 mm. Circular sheeted dough 3.0 cm in diameter was cut and baked for 15 min at 180° C. The biscuit was allowed to cool at room temperature, and packaged in Bioxial oriented polypropylene metalized (BOPPM) 20/20 micron.

3. Chemical composition.

Moisture content, pH value, total sugars, reducing and non- reducing sugars, starch, protein, fat, ash and crude fiber contents were determined according to the methods of the **A.A.C.C (2000).**

4. Sensory evaluation of products

The produced biscuit samples were subjected to sensory evaluation test. Ten semi trained panelists were evaluated (numerical scoring) the samples for (taste, mouth feel, crust color, crumb color, texture and odor, general appearance and Overall acceptability) according to Kulp *et al*. (1985).

5. Statistical analysis

The sensory evaluations of the products were statistically analyzed by analysis of variance (ANOVA) according to the method of **SAS Program, (1998)**.

6. Physical properties of biscuits

6.1. Weight

Biscuits were weighed in grams after two hours from baking as described by method 10-05 **(A.A.C.C. 2000)).**

6.2. Volume and Specific volume:

Volume of biscuits was determined according to the **A.A.C.C. (2000),** using the seed displacement method by using rapeseed. Specific volume was calculated by using the following equation:

Specific volume= Volume (ml)/ Weight (gm).

7. Biscuit texture analysis:

The texture of the supplemented biscuits with date powder at levels of 10,20,30,40, and 50% was measured using the Texture Analyzer (Cometech, B type, Taiwan). A test speed of 1 mm/s was used for all tests. Three replicates of each treatment were conducted for the evaluating of breaking strength. Biscuits were broken using the three point bending rig probe. The experimental conditions were as the fowling:

Supports 50 mm apart, a 20 mm probe travel distance and a trigger force of 20g. The force at break (N) was measured **(Bourne, 2002).**

8. Microbiological evaluation

The total bacterial, yeasts and molds counts were done in order to determine the microbiological evaluation for the biscuits.

8.1. Sample preparation

Ten gram of each of sample was weighed under aseptic condition and transferred into a sterile flask. A known volume of a sterile water 90 ml. was added and shacked 2-3 min. and several dilutions were made (1/10, $1/10^2$, $1/10^3$).

8.2. Determination of the total bacteria counts (TBC):

The total bacterial plate count was enumerated according to the method of **(A.P.H.A., 1971**).

8.3. Determination of yeast and moulds:

Yeasts and moulds were determined in the samples according to **(Galloway and Burgess, 1952)**.

RESULT AND DISSECTION

1. Chemical composition of raw materials

The obtained results in Table (2) showed the chemical composition of the soft wheat flour, date powder of El Sakkoti and Tamr El wadi, milk powder and whole egg. The data showed that the moisture, ash, protein, crude fat and total carbohydrates of soft wheat flour were 12.70, 0.51, 9.87, 1.11, 0.48 and 88.03%; respectively. Doweidar (2001) studied the chemical characteristics of soft wheat flours and found that the crude protein, total carbohydrate, fat, ash and crude fiber were 8.97, 89.21, 0.67, 0.44, and 0.71%; respectively. Whereas, El-Sharnouby *et al.*,(2012) reported that the chemical composition of soft wheat flour 72% extract were 11.40, 1.0, 10.50, 1.6, 0.5, 75.0% for the moisture, ether extract, crude

protein, crude fiber, ash and carbohydrates; respectively.

Data in Table (2) illustrated the chemical composition of El Sakkoti and Tamr El wadi date powders. For El Sakkoti the results were 4.43, 1.40, 1.62, 1.62, 3.90 and 91.62% for the moisture, ash, protein, crude fat, crude fiber and carbohydrates; respectively. Whereas, for Tamr El wadi date powder was 5.26, 1.35, 1.58, 1.58, 3.82 and 91.87% on dry weight basis.

Table (2): Chemical composition of raw materials used for biscuits (on dry weight)*

Components	Wheat flour	Date powder of El Sakkoti	Date powder of Tamr El wadi	milk powder	Whole egg
Moisture (%)	12.70±0.13	4.43±0.01	5.26±0.007	9.4±0.16	74.5±0.11
Ash (%)	0.51±0.015	1.40±0.01	1.35±0.05	7.1±0.13	1.33± 0.1
Protein (%)	9.87±0.17	1.62±0.01	1.58±0.01	34.5±0.23	12.8±0.21
Crude fat (%)	1.11±0.01	1.62±0.01	1.58±0.01	0.32±0.03	11.5±0.25
Crude fiber (%)	0.48±0.02	3.90±0.01	3.82±0.04	-	-
Total carbohydrates (%)**	88.03	91.62	91.87	58.08	0.8

*Means of three replicates ± SD.
**Total carbohydrates (by difference)

The results also showed that the moisture, ash, protein, crude fat and total carbohydrates of milk powder were 3.40, 5.08, 26.50, 27.32 and 37.70%; respectively. The results are in agreement with Kajal *et al.*, (2012) who reported that the moisture, ash, protein, crude fat and total carbohydrates of Nido milk powder were 4.49, 5.48, 26.04, 27.83, and 36.16%; respectively.

The obtained results showed that the moisture, ash, protein, crude fat and total carbohydrates of whole egg were 74.50, 1.33, 12.80, 11.50 and 0.80%; respectively.

2. Sensory evaluation of produced biscuits.

The effect of date powder replacement on the sensory characteristics of the biscuits is presented in Table (3). The results indicated that the addition of date powder to the biscuits as a sugar substitution led to improve the organoleptic quality of the product till 30% replacement ratio.

The results indicated that there were no significant ($p<0.05$) differences in the sensory evaluation values between the biscuit samples with date powder replacement up to 40% for the general appearance, but the scores were significantly ($p<0.05$) reduced for the control and the samples with 50% date powder replacement. As shown in Table 3, the organoleptic quality of biscuits had low scores with increasing the level of the date powder substitution above

30% and the biscuits produced had dark crumb color and unacceptable texture compared with the control one.

Taste and mouth feel of the biscuits were affected at levels 40% and 50%; respectively. Biscuits had a coarse mouth feel at level of 50%; meanwhile at 10% and 20% supplementation the qualities of the biscuits were not adversely affected.

From the above evaluation, it could be concluded that date powder could be incorporated up to 30% in the biscuits formula without affecting their sensory quality. The obtained results are in an agreement with those of **El-Sharnouby (2012),** who reported that highly acceptable biscuits could be obtained by incorporating 30% of date powder in the formula.

3. Influence of date powder supplementation on the physical characteristics of biscuits.

Biscuits prepared with date powder replacement levels of 10, 20, 30, 40 and 50% were evaluated for various physical parameters. Addition of date powder decreased the specific volume (cm^3/g) of the biscuits produced from 2.63 for control to 1.50 (cm^3/g) for biscuit fortified with date powder of El Sakkoti and from 2.63 for control to 1.47 (cm^3/g) for Tamr El wadi. On the other hand the density (g/cm^3) increased from 0.38 for control to 0.67(g/cm^3) El Sakkoti, and from 0.38 to 0.56 (g/cm^3) for Tamr El wadi (Table 4). The hardness value (N) decreased from 13.26 for control to 12.41 and 12.33 for fortified biscuits with 50% El Sakkoti and Tamr El wadi date powder; respectively. As seen from the results in Table 4 biscuits became softer as a result of increasing the moisture content due to the date powder supplementation.

The results were in accordance with Fahloul *et al.,* (2010) who mentioned that by increasing of date powder levels the biscuit hardness values was decreased. Khouryieh and Aramouni (2012) mentioned that the biscuit hardness is related to the development of gluten and the interaction with flour ingredients in the formula. The possible reason for this result was due to date powder or date syrup by virtue of having more sugar content diluting the gluten, affecting the interaction of gluten and other ingredients (Alsenaien *et al*., 2015).

5. Mineral content of date powders supplemented biscuits

Results in the Table (6) illustrated the mineral contents of date powders supplemented biscuits. There were no appreciable differences between the two biscuits supplemented with 30% El Sakkoti and Tamr El wadi date powder.

Table (3): Sensory evaluation of biscuit as affected by different levels of date powders supplementation (mean of 10 values)*.

Treatments		General appearance (20)	Odor (10)	Taste (20)	Texture (15)	Mouth feel (10)	crust color (10)	crumb color (15)	Overall acceptability (100)
control		16.70^{c}±0.67	10.0 ^{a} ±0.0	17.90^{bc}±0.57	11.50^{c}±1.43	8.70^{ab}±1.25	6.90^{f}±0.88	14.70^{a}±0.67	86.40c ± 1.84
El Sakkoti	10%	17.90^{b}±0.32	10.0 ^{a} ±0.0	18.70^{ab}±0.48	12.00^{bc}±0.75	9.15^{a}±0.37	9.05^{ab}±1.1	13.85^{a}±0.58	89.35^{a} ±0.32
	20%	18.30^{ab}±0.67	10.0 ^{a} ±0.0	18.0^{bc}±0.67	12.45^{ab}±0.44	8.40^{ab}±0.41	9.15^{a}±0.64	13.75^{abc}±0.35	91.10^{a} ±1.6
	30%	18.80^{a}±1.14	9.50^{b}±0.41	18.90^{a}±1.2	13.10^{a}±0.61	8.20^{b}±0.28	8.95^{ab}±0.67	13.25^{c}±0.92	92. 0^{a} ±3.05
	40%	17.60^{b}±0.84	9.50^{b}±0.41	17.75^{c}±0.68	13.0^{a}±0.78	5.80^{bc}±0.62	8.00^{cd}±0.67	12.10^{d}±1.2	86.40^{c} ±1.89
	50%	14.60^{e}±1.58	8.0^{c}±0.78	15.90^{d}±1.2	9.90^{d}±0.91	5.30^{cd}±1.23	4.80^{e}±1.15	9.10^{e}±2.18	68.30^{d}±4.97
Tamr El wadi	10%	18.0^{ab}±0.82	10.0 ^{a} ±0.0	18.45^{abc}±0.76	12.10^{b}±^{c}0.76	8.20^{b}±0.41	9.00^{ab}±0.71	14.70^{a}±0.42	90.90^{a} ±1.26
	20%	18.10^{ab}±0.32	10.0 ^{a} ±0.0	18.40^{abc}±0.84	12.70^{a}±0.63	8.80^{ab}±0.69	8.81a^{b}±0.54	14.30^{ab}±0.48	91.11^{a} ± 0.85
	30%	18.80^{a}±1.14	9.40^{a}±0.52	19.0^{a}±1.05	13.15^{a}±0.58	8.70^{bc}±0.66	8.40^{bc}±0.55	14.10^{abc}±0.52	91.80^{a} ±2.07
	40%	18.10^{ab}±1.2	9.30^{b}±0.48	18.20^{a}±^{bc}1.03	12.95^{a}±0.69	6.70^{b}±0.63	7.70^{d}±0.28	13.75^{cb}±1.34	87.90^{bc} ±2.85
	50%	15.70^{d}±1.06	8.05^{c}±0.93	14.50^{e}±1.43	10.50^{c}±0.91	4.80^{d}±1.06	5.30^{e}±0.42	9.80^{e}±1.03	69.05^{d} ±3.49
LSD		0.8508	0.406	0.8397	0.7178	0.897	0.679	0.907	2.7229

*Means of ten replicates ± SD.

Means within a column showing the same letter(s) are not significantly different ($p \leq 0.05$) by using Duncan Multiple Range Test.

Table (4): Influence of date powder supplementation on the physical characteristics of biscuits.*

Sample		Volume $(cm)^3$	Weight (g)	Specific Volume (cm^3/g)	Density (g/cm^3)	Hardness (N)
Control		11.00±1.9	4.18±0.2	2.63±0.2	0.38±0.01	13.26±0.33
Date powder of El Sakkoti	10%	10.80±1.1	4.76±0.11	2.27±0.13	0.44±0.01	13.15±0.12
	20%	11.00±0.9	5.08±0.5	2.17±0.09	0.46±0.02	13.00±0.09
	30%	10.00±1.3	5.24±0.3	1.91±0.05	0.52±0.02	12.82±0.13
	40%	10.40±1.5	6.08±0.6	1.71±0.1	0.58±0.01	12.66±0.21
	50%	10.80±1.5	7.22±0.3	1.50±0.1	0.67±0.01	12.41±0.2
Date powder of Tamr El	10%	10.60±1.3	4.36±0.5	2.43±0.12	0.41±0.02	13.19±0.1
	20%	11.40±1.7	4.92±0.22	2.32±0.2	0.43±0.01	13.04±0.2
	30%	11.00±1.2	5.50±0.32	2.00±0.12	0.50±0.01	12.76±0.23
	40%	10.80±0.9	6.10±0.21	1.77±0.11	0.56±0.011	12.59±0.12
	50%	10.40±2	7.08±0.4	1.47±0.12	0.68±0.012	12.33±0.1

*Means of three replicates ± SD

4. Chemical composition of produced biscuits.

The chemical components of the biscuits made from wheat flour and supplemented with 30% of El Sakkoti and Tamr El wadi date powder are shown in Table (5). The results indicated that there was an increase in the moisture, starch, ash and fiber content with the addition of date powders by 30%. The results are in agreement with those reported by El-Sharnouby *et al*., (2012). The total sugars, protein and total carbohydrates slightly decreased in biscuits produced by supplementation of 30% date powder compared to the control. These results are in agreement with those reported by Suleiman *et al.*, (2011).

On the other hand, it could be recognized that the 30% addition of date powders led to increase the minerals in the biscuits compared with the control. The potassium content was 129.65 for control and 172.24, 173.0 for biscuit[1] and biscuit[2]; respectively. Similarly the values of calcium, phosphor and iron were 29.83, 149.49 and 1.81 for control and became 41.36, 162.52 and 2.04 for biscuit[1] 43.57, 159.53 and 3.04 for biscuit[2]; respectively. The increment was due to addition of date powders which having higher contents of calcium tri phosphate and iron and this very important for children nutrition in primary, preparatory and secondary schools.

5. Effect of storage period (at room temperature) on the biscuit bacterial count (cfu/g).

Tables 6 and 7 illustrated the microbial analyses of the biscuit partially supplemented with date powders influenced by different storage periods for 6 months. It was observed that the total bacterial count

was not detected in the zero time for control and all treatments because of the high temperature used for baking which will be able to kill all the microorganisms. After 2 months of storage, the bacterial count was13.5×10^1cfu/g and became 60×10^1 cfu/g after 6 months of storage for the control, while the bacterial counts were 14×10^1 and 12.5×10^1 after 2 months and became55×10^1 and 50×10^1after 6 months for biscuit[1] and biscuit[2]; respectively.

Table (5): Chemical composition of biscuit supplemented with date powder 30%*.

Properties	Treatments		
	control	Biscuit [1]	Biscuit [2]
Moisture content %	4.35±0.09	5.10±0.1	5.50±0.08
Reducing sugars %	2.03±0.03	4.52±0.02	4.67±0.03
Non- reducing sugars %	19.82±0.1	14.38±0.09	14.27±0.1
Total sugars %	21.85±0.2	18.90±0.1	18.94±0.1
Starch%	50.21±0.08	51.63±0.2	51.85±0.05
Crude fiber %	0.31±0.008	0.58±0.006	0.53±0.01
Protein %	10.09±0.09	10.01±0.1	9.98±0.2
Fat %	11.32±0.02	11.10±0.04	11.00±0.3
Ash %	0.58±0.04	0.81±0.01	0.88±0.06
Total carbohydrates% (by difference)	73.66	72.98	72.64

*Means of three replicates ± SD.
Biscuit [1]: biscuit supplemented with 30% date powder of El Sakkoti.
Biscuit [2]: biscuit supplemented with 30% date powder of Tamr El wadi.

Table (6). Minerals content of date powders supplemented biscuit

Mineral contents	control	Biscuit[1]	Biscuit[2]
Macro-Elements (mg /100 g)			
Calcium (Ca)	29.83	41.36	43.57
Potassium (K)	129.65	172.24	173.00
Sodium (Na)	27.29	31.11	29.15
Magnesium (Mg)	28.16	32.84	34.92
Phosphor (P)	149.49	162.52	159.53
Micro-Elements (mg /100 g)			
Iron (Fe)	1.81	2.04	3.04
Zinc (Zn)	1.09	1.12	1.82
Cupper (Cu)	0.15	0.19	0.17
Manganese (Mn)	0.82	0.85	0.83

Biscuit [1]: biscuit fortified with 30% date powder of El Sakkoti.
Biscuit [2]: biscuit fortified with 30% date powder of Tamr El wadi**.**

The mold and yeast count was not detected in the zero time for control samples because of the reason mentioned above. The mold and yeast count was 3×10^1cfu/g after 2 months of storage and 19×10^1cfu/g after 6 months of storage for control sample, while was 3.5×10^1 and 3.5×10^1 for biscuit[1] ,and became18×10^1 and 18×10^1 for biscuit[2]; respectively.

The results were very low compared to the Egyptian Standard Specification (No.5117\2008) which stated that the bacterial total count in the school biscuit was not more than 10^4cfu/g and 100cfu/g. This means that the sanitation conditions were practiced during processing and handling of the biscuits.

From this Table it could be noticed that the bacterial total count of biscuit ranged from 125 to 600 cfu/g after storage for 6 months and these results were lower than of those reported by Sulieman *et al.,* (2011) who mentioned that the bacterial total count of biscuit prepared from partial substitution of wheat flour with date powder ranged from1950 to 500000cfu/g. The presence of the microbes in such high levels is not acceptable; however it could be due to the cross–contamination during processing or post contamination.

Table (6): Effect of storage period (at room temperature) on the biscuit total bacterial count (cfu/g).

Period of storage	Treatments		
	Control	biscuit [1]	biscuit [2]
Zero time		ND*	
2 months	$13.5^{ab}\times10^1$	$14^{a}\times10^1$	$12.5^{b}\times10^1$
4 months	$44.5^{a}\times10^1$	$40^{a}\times10^1$	$35^{a}\times10^1$
6 months	$60^{a}\times10^1$	$55^{ab}\times10^1$	$50^{b}\times10^1$

*ND: not detected.
Biscuit [1]: biscuit fortified with 30% date powder of El Sakkoti.
Biscuit [2]: biscuit fortified with 30% date powder of Tamr El wadi.

Table (7): Effect of storage period (at room temperature) on the biscuit yeasts and molds count (cfu/g).

Period of storage	Treatments		
	Control	biscuit [1]	biscuit [2]
Zero time		ND*	
2 months	$3^{a}\times10^1$	$3.5^{a}\times10^1$	$3.5^{a}\times10^1$
4 months	$7^{a}\times10^1$	$5^{a}\times10^1$	$6^{a}\times10^1$
6 months	$9^{a}\times10^1$	$8^{a}\times10^1$	$8^{a}\times10^1$

*ND: not detected
Biscuit [1]: biscuit fortified with 30% date powder of El Sakkoti.
Biscuit [2]: biscuit fortified with 30% date powder of Tamr El Wadi.

CONCLUSION

From the above results it could be concluded that 30% of date powder was the best supplementation because it improved the general appearance, taste, texture and crust color compared with control. On the other hand, it increased the minerals content, especially potassium, calcium, phosphor and iron.

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الملخص العربى

التقييم الكيمائى، الفيزيقى والحسى للبسكويت المدعم بمسحوق التمر

محمد احمد قناوى[1]، فوزى على حسن السكرى[1]، محمد نجيب قناوى[1]، مصطفى طه محمدى عسوس[2]
زينب أحمد حسن عبد الجليل[2]

[1]قسم علوم الأغذية، كلية الزراعة، جامعة المنيا
[2]معهد بحوث تكنولوجيا الأغذية، مركز البحوث الزراعية

فى هذة الدراسة، تمت دراسة تأثيرات أستخدام مسحوق تمرالسكوتى وتمرالوادى كبديل للسكر فى انتاج بسكويت على الخصائص الحسية، الطبيعية، التركيب الكيماوى، محتوى العناصر المعدنية والمحتوى الميكروبى للبسكويت تحت الدراسة. وقد أظهرت نتأئج التقييم الحسى على امكانية استبدال السكر بمسحوق التمر بنسبة تصل إلى 30% لانتاج البسكويت. ولقد لوحظ ان هناك نقص فى الحجم النوعى والكثافة، وان هناك زيادة فى الصلابة مع زيادة مستويات التدعيم من مسحوق التمر.

وقد اظهرت نتائج التركيب الكيماوى للبسكويت المدعم بمسحوق التمر ان هناك زيادة فى محتوى الرطوبة، النشا، الرماد ومحتوى الألياف مع أضافة مسحوق التمر. و لوحظ أنخفاض بسيط فى محتوى السكريات الكلية، البروتينات والكربوهيدرات الكلية للبسكويت مقارنة بالكنترول. وجد ايضا زيادة ملحوظة فى محتوى المعادن للبسكويت المدعم بمسحوق التمر و هذا يرجع إلى غنى التمر بالعناصر المعدنية . على الجانب الآخر لم يكن هناك تاثيرات ملحوظة لاضافات مسحوق التمر كبديل للسكر على المحتوى الميكروبى للبسكويت المدعم مقارنة مع الكنترول.