

## PRODUCTION OF IMPROVED PRODUCTS FROM DATE.

Nadir, A.; I. M. f. Helmy and K. I. Hamad

Food Science and Technology Department, National Research Center,  
Cairo, Egypt.

### ABSTRACT

Different improved date products were prepared (combot, Tamruddin (TD) and glazed date) from three date varieties (Samani, Zaghloul and Hayany). Ascorbic acid and sodium metabisulphate were added to combot samples. Vanilla, banana and orange juice as a flavor materials were added to tamruddin samples. Also, the glazed date prepared as a control or coated with chocolate syrup. Gross chemical composition for raw dates, different date products, minerals content and color measurements were determined. Organoleptic properties were studied for different products. Results showed that, Zaghloul date had high values of T.S.%, protein, total and reducing sugars, total phenols.

The lowest and highest values for total acidity and pH were noticed in Hayany and Samani dates, respectively. Sodium, potassium, calcium, phosphorus and manganese were the major minerals among the investigated date samples.

### INTRODUCTION

Dates (*Phoenix dactylifera* L.) are considered a major fruit crop in the Middle East countries. Egypt is one of the countries, which are known to produce more dates, hence the local production reached about 1102 thousand tons in 2001, compared to the world production, which was about 5353 thousand tons (FAO, 2001). Egypt with its varied agro-climatic conditions, is one of the few countries producing the different varieties of dates. The soft varieties such as Hayany, Amhat, Zaghloul, Samani and Bent-Aisha are grown in the Nile Delta and the lower part of Giza governorate (Nezam El-Din, 2000). From the view of chemical composition, Zaghloul (soft variety) at Khalal stage had moisture content ranged from 64.33 to 65.63% (El-Salhy, 2000). The moisture content of four soft date varieties, i.e. Hayany, sofr-Eldomain, Kaboshy and Homr-Baker grown at Sharkia Governoate, Egypt at Khalal stage ranged between 65.61 and 68.17 (Sourial *et al.*, 1986). Hussein *et al.*, (1999) found that the total acidity (as malic acid) of Hayany date at harvest was 0.28% (on dry weight basis). Protein content of soft date varieties grown in different districts of North Sinai at khalal stage ranged between 2.4 and 5.4% on dry weight basis (Habib *et al.*, 1984). In commercially ripe dates, fibers content amounted to 2-6% of the date flesh (on dry weight basis) but in low quality dates this percentage would be higher, up to 10% on dry weight basis (Barreveld, 1994). Date cultivars are considered as good sources of some important minerals such as Ca, Mg, P, K, Fe, Cu and Zn, while they are extremely low in Na, is a desirable food for hypertensive persons who advised to consume low sodium diets (Ahmed *et al.*, 1995 and Al-Hooti *et al.*, 2002). Total sugars content of four soft dates i.e., Hayany, sofr-Eldomain, Kaboshy and Homer-Bake, at Khalal stage ranged from 72.20 to 80.70% (on dry weight basis) (Sourial *et al.*, 1986). Total phenols of Amhat dates at khalal stage was 2.89% (on dry weight basis) (Nazem El-Din and Abd El-Hameed, 1997).

Tamruddin, a dried date product had been made by Sumainah and Al-Nakhal (1987) from "Rezaiz" date in Saudi Arabia at tamr stage.

In Egypt, Ramadan (1990) prepared date sheets from "saidy date variety (semi-dry date) with or without additions of pectin, citric acid, L-ascorbic acid, milk powder and Na-metabisulfite.

The main objectives addressed in this work deal with preparing untraditional products like date combot, Tamruddin (date sheet) and glazed date from local varieties to increase their utilization.

## MATERIALS AND METHODS

### Materials

Samani, Zaghoul and Hayany dates in khalal stage were obtained from local market. The dates were packaged in plastic bags and stored in refrigerator at  $5 \pm 1^{\circ}\text{C}$  until analyzed. Ascorbic and citric acids, calcium chloride, sodium metabisulphite and potassium sorbate were obtained from Sigma Chemical Co.

### Preparation of date combot samples.

Samani, Zaghoul and Hayany dates were pitted, peeled and washed in tap water. The peeled dates were immersed in sucrose solution (30%). Each variety of date was divided into three parts. The first part was control, the second part was treated with ascorbic acid (4 g/L) and the third part was treated with sodium metabisulphate (0.3 g/L). The contents were boiled at  $100^{\circ}\text{C}$  for 30 min. Ascorbic acid and sodium metabisulphite were added after boiling when the batches were still hot, mixed and all brought to equilibrate at room temperature. Date combot samples were packed while hot in glass jars and immediately closed. Samples were stored at room temperature until analyzed.

### Preparation of Tamruddin (TD) samples.

Different date varieties were pitted and washed in tap water. Depitted date of each variety was divided into four parts, the first part was control and homogenized with 150g water in blender for 2min. the second, third and fourth parts were homogenized with 150g water + 1 g ascorbic acid + 1g vanillin, 150g water + 100g peeled banana and 150g orange juice in blender for 2 min to prepare vanilla TD, Banana TD and orange TD, respectively. The homogenate is strained through cheese cloth to tefal trays (23 x 33 cm) embedded with polyethylene sheets, each oiled with few drops paraffin oil.

The trays were held in oven at  $70^{\circ}\text{C}$  for 8h. TD samples were packed in polyethylene sheets and stored at room temperature until analyzed. Tamruddin products are reconstituted by homogenization with water to 15% T.S.S., this is the more usual form for consuming kamaruddin (El-Nakhal, et al., 1987).

### Preparation of glazed dates samples.

Dates were first washed in tap water, pitted. The syrup was prepared from 0.5 Kg of sucrose dissolved in 1L of distilled water. The syrup also

contained 0.05% each of  $\text{CaCl}_2$  and potassium sorbate. The total soluble solids content of the syrup was 35.5° Brix and pH 6.5, the pH of the syrup was adjusted to 2.8 with a mixture of citric and ascorbic acids (4 : 1) solution (1.6g citric + 0.4 g ascorbic acids). 0.5 Kg for each date variety was separately soaked in 1L each of the syrup for overnight. Then these dates in syrup were heated to boiling point and maintained for 2 min after which they were cooled to room temperature and the Brix values determined. The Brix values of the syrup were gradually increased in increments of 5-10° Brix with sucrose syrup at 2-3 days intervals until the final Brix values reached 75°C for both the varieties in 23 days. At this stage, each date variety was divided into two parts. The first part was control and the second part was coated with chocolate syrup.

#### **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. The pH of samples was measured using a digital pH-meter (HANNA, H1902 m Germany.), and three measurements were taken for each sample. Total phenols were determined according to Maier and Metzger (1965).

Minerals content was determined by digestion of samples with sulphuric acid conc. (5 ml) and perchloric acid conc. (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). Meanwhile, phosphorus content was determined spectrophotometrically as described by A.O.A.C. (1995).

The color of different samples was measured using a spectro-colorimeter (Tristimulus Color Machine) with CIE lab color scale (Hunter, Lab Scan XE, Germany) calibrated with a white standard tile of Hunter Lab color standard (LXNO. 16379):  $X = 77.26$ ,  $Y = 81.94$  and  $Z = 88.14$  ( $L^* = 92.71$ ;  $a^* = -0.89$ ;  $b^* = -0.18$ ). Color difference ( $\Delta E$ ) was calculated from a, b and L parameters, using Hunter-scotfield's equation (Hunter, 1975) as follows:

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

Where  $a = a - a_0$ ;  $b = b - b_0$  and  $L = L - L_0$  subscript "0" indicates color of control.

Hue angle ( $t_g^{-1} b/a$ ) and saturation index ( $\sqrt{a^2 + b^2}$ ) were also calculated.

Different sensory properties were evaluated as described by Faridi and Rubenthaler (1984). The organoleptic scores involved color (10), taste (10), flavour (10), texture (10) and acceptability (10) for date combot, tamruddin and glazed date samples. The main values for each of the parameters in organoleptic evaluation were subjected to statistical analysis using analysis of variance and least significant difference (LSD) described by Richard & Gouri (1987).

## RESULTS AND DISCUSSION

### 1- Chemical composition of date varieties:

#### 1-1- Gross chemical composition of date varieties:

Table (1) shows gross chemical composition of date varieties. Total solids were increased in Zaghloul date compared with those of other date samples. Samani and Zaghloul dates contained 0.30 and 0.36% total acidity, respectively (as malic acid but, Hayany date had 0.27% total acidity. The highest value for pH was 6.19 for Samani date, while its lowest value was 5.98 for Hayany date. Zaghloul date contained higher values of protein 2.94% than those of Samani and Hayany dates. The results also indicate that date samples contained 0.58-0.76% fat, 4.93-6.81% fibers and 1.80-2.10% ash. The highest total and reducing sugars were 80.64 and 62.81%, respectively in Zaghloul date. There was no great change in results of total phenol values in different date varieties. These results are in agreement with those obtained by Mohammed et al., (1985), Youssef et al., (1992), Nezam El-Din (1996 a,b) and Abd El-Fattah (1998).

**Table (1): Gross chemical composition of date varieties (on dry weight basis).**

Components %	Samani date	Zaghloul date	Hayany date
Total solids	32.59	36.75	31.37
Total acidity (as malic acid)	0.30	0.36	0.27
pH	6.19	6.00	5.98
Protein	2.72	2.94	2.58
Fat	0.76	0.58	0.63
Fibers	7.59	4.93	6.81
Ash	2.10	1.88	1.80
Total sugars	74.89	80.64	72.35
Reducing sugars	57.62	62.81	55.19
Non-reducing sugars	17.27	17.83	17.16
Total phenols	2.25	2.39	2.30

#### 1-2- Minerals content of date varieties:

Minerals contents for different varieties of date (Samani, Zaghloul and Hanany) are shown in Table (2).

**Table (2): Mineral contents of different date samples (mg/100g on dry weight basis).**

Minerals	Samani date	Zaghloul date	Hayany date
Sodium	32.59	26.71	30.86
Potassium	1283.36	1264.28	1270
Calcium	100.52	96.30	114.39
Phosphorus	118.41	110.68	124.60
Magnesium	81.67	73.42	93.85
Iron	1.90	1.94	2.00
Copper	0.83	0.80	0.86
Zinc	0.89	0.93	0.96
Manganese	1.07	1.10	1.65

From these results it was observed that, potassium was present in the highest content in all date varieties followed by phosphorus, calcium and magnesium. Among the microelements, the iron concentration found in the three date varieties was higher than copper, zinc and manganese contents. These results were similar with those obtained by Ahmed *et al.*, (1995).

**2-Chemical composition of processed date products:**

**2-1- Gross chemical composition of processed date products:**

**2-1-1- Gross chemical composition of processed date combot:**

Chemical compositions of different date combot samples are shown in Table (3). Data indicate that, Zaghloul date combot samples had high contents of T.S. which varied from 34.25% to 34.48%. T.S. were high in control samples compared to date combot samples with ascorbic acid and sodium metabisulphite. It was noticed that, total acidity was directly proportional with pH values in all date combot samples and their values increased to be the highest in control ones and reduced to be the lowest in those with sodium metabisulphite. No great change in protein, fat and ash contents was noticed when ascorbic acid and sodium metabisulphate were added. There was a noticeable reduction in fibers values in date combot samples with ascorbic acid and sodium metabisulphite, compared to those of prepared control, where it was 5.06% and 4.59%, 4.67% and 4.60% and 4.78% and 4.39% for date combot samples prepared from Samani, Zaghloul and Hayany date, respectively.

**Table (3): Gross chemical composition ( % ) of different date combot samples (on dry weight basis).**

Components	Total solids	Acidity (as malic acid)	pH	Protein	Fat	Fibers	Ash	Total sugars	Reducing sugars	Non-reducing sugars
<b>Combot samples</b>										
Samani date combot (control)	32.36	0.60	4.50	2.39	1.62	5.14	1.92	76.23	49.80	26.43
Samani date combot with ascorbic acid	32.22	0.56	4.42	2.41	1.67	5.06	1.97	76.57	50.94	25.63
Samani date combot with sod. Metabisulphite	32.17	0.28	6.45	2.45	1.70	4.59	2.00	77.71	53.86	23.85
Zaghloul date combot (control)	34.48	0.69	4.71	2.68	1.28	4.72	1.58	79.65	47.26	32.39
Zaghloul date combot with ascorbic acid	34.31	0.65	4.68	2.71	1.30	4.67	1.60	79.92	48.75	30.37
Zaghloul date combot with sod. Metabisulphite	34.25	0.32	6.36	2.76	1.33	4.60	1.84	80.56	50.91	29.65
Hayany date combot (control)	31.30	0.56	4.67	2.17	1.38	4.84	1.42	74.10	45.73	28.37
Hayany date combot with ascorbic acid	31.14	0.50	4.62	2.20	1.41	4.78	1.45	74.38	46.49	27.89
Hayany date combot with sod. Meta bisulphate	31.07	0.24	6.31	2.24	1.43	4.39	1.50	75.21	48.70	26.51

Total sugars content was increased to 76.57% and 77.71% for Samani date combot prepared with ascorbic acid and sodium metabisulphite, respectively while, it was 79.92% and 80.56% for Zaghloul date combot

processed with ascorbic acid and sodium metbisulphite, respectively. The increasing rate of reducing sugars content was higher in date combot samples prepared with sodium metabisulphate than those of control. These results are in agreement with those reported by Abd El-Fattah (1998).

**2-1-2- Gross chemical composition of processed glazed date:**

Chemical compositions of different glazed date samples is given in Table (4). The highest values of T.S., protein and total acidity were noticed in glazed date samples prepared from Zaghloul date with chocolate coated where, they reached 37.42%, 2.45% and 0.71%, respectively. Chocolate coated Samani glazed date had a maximum value of fat content (2.94%). The coating with chocolate for Haynay glazed date samples caused the highest reduction in total and reducing sugars contents (65.51 and 50.13%, respectively). These results are in agreement with those obtained by El-Nakhal et al., (1987).

**Table (4): Gross chemical composition (%) of different glazed date samples (on dry weight basis).**

Glazed date samples	Total solids	Acidity (as malic acid)	pH	Protein	Fat	Fibers	Ash	Total sugars	Reducing sugars	Non-reducing sugars
Samani glazed date control	81.51	0.55	4.20	1.65	0.82	2.56	1.44	87.91	64.21	23.70
Chocolate coated	83.29	0.64	4.10	2.37	2.94	2.32	1.21	76.82	55.39	21.53
Zaghloul glazed date control	84.60	0.60	4.31	1.74	0.63	2.39	1.24	82.10	61.48	20.62
Chocolate coated	86.43	0.71	4.18	2.45	2.62	2.13	1.13	69.65	52.24	17.41
Hayany glazed date control	76.25	0.53	4.26	1.59	0.72	2.45	1.11	78.17	59.67	18.50
Chocolate coated	79.38	0.62	4.12	2.28	2.79	2.26	0.98	65.51	50.13	15.38

**2-1-3- Gross chemical composition of processed tamruddin:**

The data reported in Table (5) indicate that, the contents of T.S.%, fat%, pH and fibers% were reduced for all tamruddin samples prepared from Samani, Zaghloul and Hayany dates compared with those of control. The rate of reduction in values of T.S.% and pH in Hayany Tamruddin samples prepared with banana was 1.96% and 1.55%, while it was 1.08% and 3.15% for those prepared with orange juice, respectively compared to control ones. Also, the same trend was observed in fat and fibers contents in Zaghloul Tamruddin samples which was 70.73% and 11.94% for those prepared with vanilla and 12.90 and 28.20% for those prepared with banana, respectively. The addition of vanilla, banana and orange juice to Tamruddin samples prepared from different date varieties increased the contents of protein, ash, total acidity and total and reducing sugars.

**Table (5): Gross chemical composition (%) of different Tamruddin samples (on dry weight basis).**

Tamruddin samples	Total solids	Acidity (as malic acid)	pH	Protein	Fat	Fibers	Ash	Total sugars	Reducing sugars	Non-reducing sugars
Samani Tamruddin (control)	86.18	0.25	6.08	2.14	1.11	2.61	1.87	77.40	64.52	12.88
Samani Tamruddin with vanilla	85.27	0.27	6.00	2.48	0.59	2.27	2.08	79.16	65.37	13.79
Samani Tamruddin with banana	84.83	0.30	5.92	2.35	0.92	2.45	2.15	85.79	71.84	13.95
Samani Tamruddin with orange juice	85.60	0.32	5.86	2.29	0.76	2.32	1.96	82.35	68.63	13.72
Zaghloul tamruddin (control)	87.06	0.29	5.94	2.26	0.70	1.50	1.73	81.56	66.49	15.07
Zaghloul tamruddin with vanilla	85.49	0.32	5.90	2.57	0.41	1.34	1.89	82.91	68.75	14.16
Zaghloul tamruddin with banana	85.14	0.34	5.87	2.49	0.62	1.17	1.95	89.47	71.19	18.28
Zaghloul Tamruddin with orange juice	86.21	0.38	5.79	2.38	0.53	1.21	1.78	85.70	73.54	12.16
Hayany Tamruddin (control)	85.29	0.22	5.89	2.09	0.92	2.42	1.68	75.31	62.66	12.71
Hayany Tamruddin with vanilla	84.10	0.23	5.83	2.36	0.56	2.13	1.82	76.88	63.84	13.04
Hayany Tamruddin with banana	83.65	0.28	5.80	2.27	0.80	2.06	1.87	83.64	68.78	14.86
Hayany Tamruddin with orange juice	84.38	0.30	5.71	2.18	0.67	2.19	1.76	80.42	66.92	13.50

Samani Tamruddin samples with banana had the highest content of ash (2.15%) while, protein and total acidity values were increased to 2.57 and 0.38%, respectively in Zaghloul Tamruddin samples. Total and reducing sugars reached to their maximum values in Zaghloul Tamruddin samples with banana and orange juice (89.47% and 73.54%, respectively). These results are in agreement with those reported by Nezam El-Din *et al.*, (1985), Ramadan (1990), Ali (1994), Nezam El-Din (1996 a,b) and Nezam El-Din and Abd El-Hameed (1997).

**2-2- Minerals content of processed date products:**

**2-2-1- Minerals content of date combot:**

The data of Table (6) revealed that, the mineral content of different date combot samples contained sodium metabisulphite was higher than others. The results of Samani date combot samples with sodium metabisulphite showed that, the rate of increasing varied between 4.09 to 15.79% from Samani date combot control sample. While, it was between 1.64 to 7.84% in case of Samani date combot containing ascorbic acid. A similar trend of increasing was reported for manganese content. Cu content represented the highest amount for Zaghloul date combot samples. Hayany date combot prepared with sodium metabisulphite had high value of iron compared with that of control. It reached 13.79% while, the rate of increasing was 6.58% in the same samples compared with those of ascorbic acid Hayany date combot. These results are in agreement with those obtained by Abd El-Fattah (1998).

**Table (6): Mineral contents of different date combot samples (mg/100g on dry weight basis).**

Minerals	Samani date combot			Zaghloul date combot			Hayany date combot		
	Control	Treated with ascorbic acid	Treated with sod.meta bisulphite	Control	Treated with ascorbic acid	Treated with sod.meta bisulphite	Control	Treated with ascorbic acid	Treated with sod.meta bisulphite
Sodium	29.68	30.46	31.10	21.83	22.62	23.15	23.41	24.62	25.57
Potassium	1171.29	1185.70	1219.25	1037.02	1069.85	1100.79	997.30	1018.10	1054.21
Calcium	90.85	93.16	95.68	78.54	81.71	83.92	88.15	91.23	95.30
Phosphorus	106.23	110.42	112.59	91.41	94.06	96.38	96.27	99.35	102.78
Magnesium	72.60	76.39	77.64	60.87	62.29	63.60	72.91	75.58	78.12
Iron	1.71	1.77	1.81	1.56	1.63	1.72	1.45	1.59	1.65
Copper	0.74	0.78	0.80	0.61	0.69	0.74	0.66	0.70	0.73
Zinc	0.80	0.84	1.86	0.76	0.80	0.85	0.73	0.76	0.81
Manganese	0.95	1.02	1.10	0.90	0.97	1.02	1.28	1.33	1.38

**2-2-2- Minerals content of glazed date:**

The content of minerals for different glazed dates is shown in Table (7). The results show that, there was a reduction in all elements levels occurred in chocolate coated glazed date samples compared to those of control. This could be mainly due to low ash content in these samples. The highest values for these elements in different control samples (mg/100g) were found to be 23.67, 878.53, 1.28 and 5.54 for sodium, potassium, iron and copper in Samani glazed sample and 67.84, 56.2, 0.60 and 0.92 for



calcium, magnesium, zinc and manganese in Hayany glazed sample, respectively. On the other hand, Samani chocolate coated glazed date contained high values of sodium and phosphorus compared with the other chocolate coated glazed date samples. Potassium, iron, copper and zinc values were increased to the highest values in Zaghloul chocolate coated glazed date sample. The same trend was noticed for values of calcium, magnesium and manganese in Hayany chocolate coated glazed date sample compared with those of the same treatment. These results are in agreement with those obtained by Abd El-Fattah (1998).

**Table (7): Mineral contents of different glazed dates (mg/100g dry weight basis).**

Minerals	Samani glazed date		Zaghloul glazed date		Hayany glazed date	
	Control	Chocolate coated	Control	Chocolate coated	Control	Chocolate coated
Sodium	23.67	17.54	16.82	15.96	18.52	16.43
Potassium	878.53	736.30	829.75	753.40	778.19	686.21
Calcium	66.82	55.49	61.48	55.81	67.84	61.50
Phosphorus	79.68	66.35	71.92	64.36	74.73	65.94
Magnesium	53.91	45.72	46.37	43.54	56.20	49.61
Iron	1.28	0.94	1.25	1.12	1.19	0.95
Copper	0.54	0.43	0.49	0.46	0.51	0.44
Zinc	0.59	0.48	0.58	0.53	0.60	0.51
Manganese	0.71	0.57	0.67	0.62	0.92	0.87

### **2-2-3- Minerals content of tamruddin:**

Mineral contents of different Tamruddin samples shown in Table (8) indicate that, Tamruddin samples with vanilla, banana and orange juice prepared from all date varieties had higher mineral content than these of control. The highest sodium and potassium contents were present in all Samani and Hayany Tamruddin samples. Phosphorus, magnesium, iron and copper contents were clearly increased in all Tamruddin samples prepared from Hayany date. On the other hand, the addition of vanilla and orange juice to Hayany Tamruddin samples increased zinc content to the highest levels while, the addition of banana to Zaghloul tamruddin sample tended to give such same effect for zinc content. Also, high levels of manganese were noticed in all Hayany Tamruddin samples. These results are in agreement with those obtained by Sumainah and El-Nakhal (1984), Nezam El-Din and Abd El-Hameed (1997).

**Table (8): Mineral contents of different tamruddin samples (mg/100 g on dry weight basis).**

Minerals	Samani Tamruddin				Zaghloul Tamruddin				Hayany Tamruddin			
	Control	With vanilla	With banana	With orange juice	Control	With vanilla	With banana	With orange juice	Control	With vanilla	With banana	With orange juice
Sodium	28.96	32.19	33.27	30.34	24.35	26.76	27.59	25.23	28.65	31.07	32.10	30.21
Potassium	1140.51	1268.12	1310.81	1195.72	1161.20	1268.03	1309.31	1195.18	1182.27	1281.15	1314.37	1240.61
Calcium	89.30	98.53	102.87	92.91	87.53	98.28	101.84	91.35	104.80	115.39	117.63	110.92
Phosphorus	104.59	116.70	121.13	109.40	101.79	112.17	115.62	103.96	114.97	125.73	129.25	121.46
Magnesium	72.46	79.86	83.52	76.10	67.48	74.54	76.10	69.78	85.43	94.65	97.36	91.60
Iron	1.67	1.87	1.95	1.75	1.76	1.98	2.03	1.82	1.84	2.07	2.11	1.93
Copper	0.71	0.81	0.86	0.75	0.74	0.86	0.91	0.76	0.79	0.88	0.91	0.82
Zinc	0.77	0.86	0.92	0.82	0.84	0.97	1.04	0.88	0.89	0.98	1.02	0.92
Manganese	0.94	1.04	1.10	0.98	1.00	1.14	1.19	1.06	1.52	1.67	1.73	1.60

**3- Color measurement of date products:**

**3-1- Color measurement of date combot:**

Hunter color values of different date combot sample are given in Table (9). Values of (L) and hue were increased with addition of ascorbic acid and sodium metabisulphate to the plate combot prepared from Samani date while, the other color values were lowered compared with control. There was a great effect in  $\Delta E$  value as a result of ascorbic acid addition to Samani date combot (3.44) while, the addition of sodium metabisulphate to the same samples caused low effect on  $\Delta E$  value (1.81).

For the color value of Zaghloul date combot samples, it was noticed that addition of ascorbic acid to samples lowered (a), (b) and saturation values while, (L) and hue values were increased compared to those of other samples. The same trend, for  $\Delta E$  results noticed in Samani date combot samples, was present in Zaghloul date combot samples but the values were increased and reached (4.38) in the case of addition ascorbic acid and (2.61) in addition sodium metabisulphate. The last same trend was occurred in Hayany date combot with highest value of  $\Delta E$  in the samples prepared with sodium metabisulphate (5.12). These results are in agreement with those reported by Abd El-Fattah (1995 and 1998).

**Table (9): Hunter color values of different date combot samples.**

Date combot samples	L*	a*	b*	a/b	Saturation	Hue	$\Delta E$
Samani date combot (control)	81.49	2.27	42.65	0.05	42.71	86.95	-
Ascorbic Samani date combot	84.64	1.80	41.36	0.04	41.40	87.57	3.44
Sod.metabisulphite Samani date combot	83.21	1.95	42.17	0.05	42.22	87.35	1.81
Zaghloul date combot (control)	79.58	7.31	34.75	0.21	35.51	78.12	-
Ascorbic Zaghloul date combot	82.95	5.67	32.49	0.17	32.98	80.10	4.38
Sod.metabisulphate Zaghloul date combot.	81.73	6.40	33.58	0.19	34.18	79.21	2.61
Hayany date combot (control)	76.60	3.92	37.24	0.11	37.45	84.00	-
Ascorbic Hayany date combot	80.72	3.11	34.31	0.09	34.45	84.82	5.12
Sod.meta bisulphate Hayany date combot.	79.44	3.37	35.60	0.09	35.76	84.59	3.33

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

**3-2- Color measurement of glazed date:**

Hunter color values of different glazed date samples are presented in Table (10). As a general direction in these results it was noticed that, processing of samples with sucrose syrup increased (L) and hue values while, the coating with chocolate increased (a) values for all glazed date samples. The reduction of (L) and hue values by coating with chocolate was 43.93 and 20.80% in Hayany samples, 36.36 and 14.43% in Samani samples, and 41.35 and 24.06% in Zaghloul ones, respectively compared to those of control. Coating with chocolate increased the value of  $\Delta E$  to reach up to 26.69 in Hayany sample. a/b ratio indicated the intensity of the red (+a) color characteristic (Francis & Clydes dale, 1975). Meanwhile, saturation and hue indicated purity and color shade, respectively (Genovese *et al.*, 1997). These results are in agreement with those reported by El-Nakhal (1987).

**Table (10): Hunter color values of different glazed date samples.**

Samples	L*	a*	b*	a/b	Saturation	Hue	ΔE
Samani glazed date control	85.70	1.29	40.60	0.03	40.62	88.18	-
Chocolate coated	62.85	8.31	36.17	0.23	37.11	77.06	23.99
Zaghloul glazed date control	82.49	3.67	36.53	0.10	36.71	84.26	-
Chocolate coated	58.36	12.51	30.84	0.41	33.28	67.92	26.32
Hayany glazed date control	80.20	3.48	39.37	0.09	39.52	84.95	-
Chocolate coated	55.72	11.63	32.52	0.36	34.54	70.32	26.69

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

### 3-3- Color measurement of Tamruddin:

The addition of vanilla and banana to Samani Tamruddin samples tended to increase (L) lightness and decrease (a) redness values compared with those of control as shown in table (11). Higher values of (b) yellowness and saturation in Samani Tamruddin samples containing banana and orange juice were reported than those of the other samples. All additions increased Hue values for all Samani Tamruddin samples. ΔE was reached to the highest value in Samani Tamruddin containing orange Juice. Same trend was noticed in Hunter values for Tamruddin samples prepared from Zaghloul date, while the values a, a/b and ΔE (color difference) were increased and the values of L, b, saturation and Hue were lowered compared to those of Samani Tamruddin samples. The results of Hayany Tamruddin samples showed that, (L) values were lowered as a result of adding orange juice compared with control. Higher values of (b) and saturation in Hayany Tamruddin containing banana and orange juice were obtained than those of other samples. Values of ΔE reached to the highest (7.07) in Hayany Tamruddin sample with banana. These results are in agreement with those reported by Garza et al., (1999) and Maskan (2001).

**Table (11): Hunter color values of different Tamruddin samples.**

Samples	L*	a*	b*	a/b	Saturation	Hue	ΔE
Samani Tamruddin (control)	76.28	3.19	39.84	0.08	39.97	85.42	-
Samani Tamruddin with vanilla	78.53	2.92	37.60	0.08	37.71	85.56	3.19
Samani Tamruddin with banana	81.24	2.37	41.59	0.06	41.66	86.74	5.32
Samani Tamruddin with orange juice	72.61	2.10	43.26	0.05	43.31	87.22	5.13
Zaghloul tamruddin (control)	72.94	9.57	28.63	0.33	30.19	71.51	-
Zaghloul tamruddin with vanilla	74.72	8.23	25.08	0.33	26.40	71.83	4.19
Zaghloul tamruddin with banana	78.38	7.40	31.75	0.23	32.60	76.88	6.64
Zaghloul Tamruddin with orange juice	70.50	6.68	34.31	0.19	34.95	78.98	6.82
Hayany Tamruddin (control)	70.35	5.70	32.47	0.18	32.97	80.04	-
Hayany Tamruddin with vanilla	73.41	4.56	28.63	0.16	29.00	80.95	5.04
Hayany Tamruddin with banana	76.72	3.81	34.90	0.11	35.11	83.77	7.07
Hayany Tamruddin with orange juice	67.60	3.35	36.26	0.09	36.41	84.72	5.24

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

## 4- Organoleptic properties of date products:

### 4-1- Organoleptic properties of date combot:

Sensory evaluation of different date combot samples was statistically analyzed as shown in Table (12). Results show that, Samani date

combot samples with ascorbic acid and sodium metabisulphate received the highest score values (47.2 and 45.8, respectively). There were no significant differences in color between date combot samples prepared with ascorbic acid or sodium metabisulphate for both Samani and Hayany varieties. In regard to taste, all date combot samples prepared with ascorbic acid or sodium metabisulphate had significant differences compared with those of control. Meanwhile, date combot samples treated with ascorbic acid or sodium metabisulphate for Samani and Hayany varieties did not show significant differences. On the other hand, there was significant differences in flavour and texture between date combot samples contained ascorbic acid or sodium metabisulphate prepared from Hayany. The last same trend of results for texture and acceptability was found between Samani date combot treated with ascorbic acid or sodium metabisulphate.

**Table (12): Organoleptic properties of different date combot samples.**

Organoleptic properties	Samani date combot			Zaghloul date combot			Hayany date combot			LSD 0.01
	Control	Treated with ascorbic acid	Treated with sod.meta bisulphite	Control	Treated with ascorbic acid	Treated with sod.meta bisulphite	Control	Treated with ascorbic acid	Treated with sod.meta bisulphite	
Color	8.4 <sup>cd</sup>	9.2 <sup>a</sup>	9.0 <sup>ab</sup>	8.1 <sup>cd</sup>	8.9 <sup>b</sup>	8.6 <sup>c</sup>	7.7 <sup>a</sup>	8.6 <sup>c</sup>	8.4 <sup>cd</sup>	0.77
Taste	8.6 <sup>c</sup>	9.3 <sup>a</sup>	9.1 <sup>ab</sup>	8.4 <sup>cd</sup>	9.0 <sup>ab</sup>	8.7 <sup>bc</sup>	8.1 <sup>d</sup>	8.8 <sup>b</sup>	8.5 <sup>c</sup>	0.41
Flavour	8.7 <sup>cd</sup>	9.6 <sup>a</sup>	9.4 <sup>ab</sup>	8.5 <sup>d</sup>	9.3 <sup>ab</sup>	9.0 <sup>bc</sup>	8.3 <sup>de</sup>	9.1 <sup>b</sup>	8.8 <sup>c</sup>	0.37
Texture	8.5 <sup>cd</sup>	9.4 <sup>a</sup>	9.1 <sup>b</sup>	8.2 <sup>de</sup>	9.0 <sup>bc</sup>	8.6 <sup>cd</sup>	8.0 <sup>e</sup>	8.7 <sup>c</sup>	8.3 <sup>d</sup>	0.32
Acceptability	8.9 <sup>bc</sup>	9.7 <sup>a</sup>	9.2 <sup>b</sup>	8.6 <sup>cd</sup>	9.5 <sup>ab</sup>	9.1 <sup>bc</sup>	8.4 <sup>d</sup>	9.0 <sup>bc</sup>	8.8 <sup>c</sup>	0.48
Total	43.1	47.2	45.8	41.8	45.7	44	40.5	44.2	42.8	

\* Any two means have the same letters at the same raw are not significant at  $p \leq 0.01$ .

**4-2- Organoleptic properties of glazed date:**

Organoleptic properties of different glazed date samples was statistically analyzed (Table, 13) and the obtained results indicated that, values of sensory properties for control samples were higher than those chocolate coated samples. There was a significant differences in taste between glazed date samples (control) and glazed date samples coated with chocolate prepared from Samani and Hayany date varieties, while there was no significant differences in taste between chocolate coated samples and control samples prepared from Zaghloul date. Also, there was significant differences in flavour between Samani glazed date sample and Samani glazed date coated with chocolate. However, there was significant differences in texture and acceptability between control and chocolate coating treatments for all glazed date samples prepared from different date varieties.

**Table (13): Organoleptic properties of different glazed date samples**

Organoleptic properties	Samani glazed date		Zaghloul glazed date		Hayany glazed date		LSD 0.01
	Control	Chocolate coated	Control	Chocolate coated	Control	Chocolate coated	
Color	9.5 <sup>a</sup>	8.6 <sup>bc</sup>	9.1 <sup>ab</sup>	8.4 <sup>c</sup>	9.0 <sup>b</sup>	8.1 <sup>cd</sup>	0.53
Taste	9.4 <sup>a</sup>	8.5 <sup>bc</sup>	9.0 <sup>ab</sup>	8.2 <sup>bc</sup>	8.7 <sup>b</sup>	8.0 <sup>c</sup>	0.67
Flavour	9.2 <sup>a</sup>	8.6 <sup>b</sup>	8.8 <sup>ab</sup>	8.3 <sup>bc</sup>	8.3 <sup>bc</sup>	8.1 <sup>cd</sup>	0.78
Texture	9.3 <sup>a</sup>	8.3 <sup>c</sup>	9.0 <sup>ab</sup>	8.1 <sup>cd</sup>	8.5 <sup>bc</sup>	7.8 <sup>d</sup>	0.58
Acceptability	9.1 <sup>a</sup>	8.4 <sup>bc</sup>	8.9 <sup>ab</sup>	8.0 <sup>c</sup>	8.6 <sup>b</sup>	7.7 <sup>cd</sup>	0.49
Total	46.5	42.4	44.8	41	43.1	39.7	

\* Any two means have the same letters at the same raw are not significant at  $p \leq 0.01$ .

#### 4-3- Organoleptic properties of tamruddin samples:

Data in Table (14) represent the organoleptic properties of different Tamruddin samples after their reconstitution. Generally, all additions improved the sensory properties of Tamruddin samples. The addition of vanilla to all Tamruddin samples prepared from different date varieties had no significant differences (at  $P < 0.01$ ) for all sensory properties compared to those of control. There was no significant differences in color, taste, texture and acceptability between Tamruddin samples with banana and orange juice prepared for different date varieties while, in regard to flavour, significant differences were noticed between the last same samples. The highest score values for all sensory properties was found in Samani Tamruddin samples with banana and orange juice where, it reached to 48.3 and 46.6, respectively.

Table (14): Organoleptic properties of different Tamruddin samples after reconstitution.

Organoleptic properties	Samani Tamruddin				Zaghloul Tamruddin				Hayany Tamruddin				LSD
	Control	Treated with vanilla	Treated with banana	Treated with orange juice	Control	Treated with vanilla	Treated with banana	Treated with orange juice	Control	Treated with vanilla	Treated with banana	Treated with orange juice	
Color	8.4 <sup>c</sup>	8.6 <sup>bc</sup>	9.7 <sup>a</sup>	9.3 <sup>ab</sup>	8.2 <sup>cd</sup>	8.4 <sup>c</sup>	9.4 <sup>ab</sup>	9.2 <sup>ab</sup>	7.9 <sup>cd</sup>	8.1 <sup>cd</sup>	9.2 <sup>ab</sup>	9.0 <sup>b</sup>	0.60
Taste	8.6 <sup>bc</sup>	8.8 <sup>b</sup>	9.6 <sup>a</sup>	9.2 <sup>ab</sup>	8.3 <sup>c</sup>	8.5 <sup>bc</sup>	9.3 <sup>ab</sup>	9.0 <sup>b</sup>	8.0 <sup>cd</sup>	8.2 <sup>c</sup>	9.0 <sup>b</sup>	8.7 <sup>bc</sup>	0.55
Flavour	8.3 <sup>d</sup>	8.6 <sup>cd</sup>	9.5 <sup>a</sup>	9.1 <sup>b</sup>	8.1 <sup>cd</sup>	8.3 <sup>d</sup>	9.2 <sup>ab</sup>	8.8 <sup>c</sup>	7.7 <sup>e</sup>	8.0 <sup>cd</sup>	8.8 <sup>c</sup>	8.6 <sup>cd</sup>	0.43
Texture	8.5 <sup>cd</sup>	8.7 <sup>c</sup>	9.8 <sup>a</sup>	9.6 <sup>ab</sup>	8.0 <sup>d</sup>	8.4 <sup>cd</sup>	9.6 <sup>ab</sup>	9.3 <sup>ab</sup>	7.8 <sup>de</sup>	8.1 <sup>d</sup>	9.3 <sup>b</sup>	9.1 <sup>bc</sup>	0.51
Acceptability	8.7 <sup>a</sup>	8.9 <sup>b</sup>	9.7 <sup>a</sup>	9.4 <sup>ab</sup>	8.4 <sup>bc</sup>	8.5 <sup>bc</sup>	9.3 <sup>ab</sup>	9.1 <sup>ab</sup>	8.0 <sup>cd</sup>	8.2 <sup>c</sup>	9.0 <sup>b</sup>	8.9 <sup>b</sup>	0.69
Total	42.5	43.6	48.3	46.6	41	42.1	46.8	45.4	39.4	40.6	45.3	44.3	

\* Any two means have the same letters at the same raw are not significant at  $P \leq 0.01$ .

#### Conclusion

From the above results, it could be concluded that, the best variety of date for producing highest quality attributes of date combot, glazed date and Tamruddin was Samani date.

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#### إنتاج منتجات محسنة من البلح

عبد العزيز ندير وإبراهيم محمد فؤاد حلمي وكمال الشناوي إبراهيم حمد  
قسم الصناعات الغذائية - المركز القومي للبحوث - القاهرة - مصر

يهدف هذا البحث إلى إنتاج منتجات محسنة من البلح (كمبوت وتمر السدين وبلح مسكر) من ٣ أصناف محلية (سماني وزغلول وحياني) في مرحلة الخلال. تم إضافة حمض الاسكوربيك وميتايبسلفيت الصوديوم إلى عينات الكمبوت، الفانليا والموز وعصير البرتقال إلى عينات تمر الدين كمواد للنكهة الطبيعية، والبلح المسكر تم تحضيره كعينة كنترول أو مغطاه بمائل الشيكولاته. وتم تقدير التركيب الكيماوي للبلح الخام وكذلك لمختلف منتجات البلح وكذلك المحتوى المعدني وقيم جهاز هنتر اللونية وكذلك الصفات الحسية لمختلف المنتجات. وقد أوضحت الدراسات أن بلح الزغلول عالي في قيم الميوسا الصلبة الكلية والبروتين والسكريات الكلية والمختزلة والفيولات الكلية. وكانت أقل وأعلى القيم للحموضة الكلية والـ pH ملحوظة في بلح الحياني والسماني على الترتيب. كان الصوديوم والبيوتاسيوم والكالسيوم والفوسفور وكذلك المنجنيز من العناصر المعدنية الكبرى في عينات البلح التي أشتملت عليها الدراسة.