

**Original Article**

**Processing untraditional products from un-pollinated Ismailia date**

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**ABSTRACT**

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Un-pollinated date used as a source of food wastes. Our present work aimed to prepare untraditional products namely cakes and drinks from un-pollinated date powder to utilize from the large amount of non-economic date fruit. Chemical composition including pH value, total solids, total acidity, moisture content, ash content, crude fat, crude protein, total carbohydrates and mineral content were measured. Also, bioactive compounds namely phenolic compounds, tannins and flavonoids were determined. In addition prepared cakes and drink samples were organoleptically evaluated. Data obtained that chemical composition of un-pollinated date powder showed that pH value, total solids, total acidity, moisture content, ash content, crude fat, crude protein, total carbohydrates were recorded 5.28, 91.99%, 0.14%, 8.01%, 3.08%, 0.78%, 1.65% and 86.48%, respectively and indicated that un-pollinated date powder considered as a good source of minerals, total phenolic compounds, total flavonoids and total tannins which recorded 3.08%, 78.61 mg/g, 277.14 mg/g and 29.82%, respectively. Sensory evaluation of three formulas from cake at different ratios were prepared. Results of sensory evaluation showed that control cake sample recorded the highest consumer acceptability followed by the formula containing ( 5 % Un-pollinated date powder : 95% wheat flour) then formula contained (10% Un-pollinated date powder : 90 % wheat flour) and (15% Un-pollinated date powder : wheat flour), respectively which recorded 9.2, 8.3, 7.6 and 7.1 scores while the other results for drink date samples which prepared from 75% Coconut milk and 25% Un-pollinated date juice had the highest values for overall acceptability which recorded to 8.8 scores in compared with the other samples. So, this study recommended that, the using of un-pollinated date products in different food industries.

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**Introduction**

Date palm (*Phoenix dactylifera L.*) is belonging to the family *Arecaceae* and dioecious fruit trees. Date palm is cultivated for a lot of purposes such as medical uses, fruit production and other uses (religious, feed, brooms and wood) (Haider *et al.*, 2012). More than 2000 species of dates are cultivated in worldwide, and date palm is an important crop in arid and semi-arid sections of the world including the Middle East, North Africa, parts of Central and South America, Southern Europe, India and Pakistan (Alfaro-Viquez *et al.*, 2018). Date palm fruit extracts had functional characteristics such as antibacterial, anti-fungal, antiviral, antioxidant, anti-inflammatory, anti-toxicant and hepatoprotective activities (Metwaly *et al.*, 2014). Date fruit is composed of a pericarp and a pit. Dates can be used as fresh fruit at khalal and rutab stages (unripe stages with short shelf life) or at Tamr stage

(ripe stage with good storability) (Singh *et al.*, 2015). Date fruit included a lot of bioactive components such as carotenoids, polyphenols, especially phenolic acid, isoflavons, lignins, flavonoids, tannins and sterols (Al-Alawi *et al.*, 2017). In 2004 Egypt is the major producers of dates (17% of world production) (Saleh *et al.*, 2011). Un-pollinated date represented 5% from total production. Un-pollinated Khalal dates must be left on palm tree until the end of khalal period to get on the best qualities. Fresh un-pollinated Siwi date is containing moisture (59.56%), total solids (40.45%), total sugars (56.09%), ash (2.14%) and ph value (5.18). Egypt production and cultivated area of siwi date variety at 2016 were 354182 tones and 41240 feddans, respectively (Ibrahim *et al.*, 2017). Bakery products are used all over the world. Cakes are the most important bakery products. Wheat flours used in cake preparation have lower

protein content, and it is known that one of the most important characteristics of cake preparation flours is particle size. Gluten does not play an important function in cake which means that flours from other grain or Beans such as chickpeas or lupine can be used (Sobhy *et al.*, 2015). Drinks are very important for the body such as tea, coffee and juice to make body active (Abdillah and Andriani, 2012). Coconut milk is a liquid resulted from the manually or mechanical pressure of the coconut meat usually with or without added water. It can also be made by adding hot water to grated coconut meat and then filtered. It is a main component in food products such as desserts, coconut jam spread, coconut syrup, bakery products and beverages. Coconut milk consists of fat, water, carbohydrate, protein, ash and antioxidant components. Coconut milk contains about 54% moisture, 35% fat and 11% solid non-fat (Alyaqoubi *et al.*, 2015). This study was aimed to prepare untraditional products from un-pollinated date to get benefit from the large amount of non-economic date fruit and the utilization of un-pollinated date powder to make healthy drinks and cupcakes.

## Materials and Methods

### Materials

Un-pollinated dates (*Phoenix dactylifera L.*) was obtained from Faculty of science farm, Damietta University, New Damietta City, Damietta Governorate, Egypt.

### Other ingredients

Wheat flour (72% extraction), sugar, egg, baking powder, milk powder, vanilla, oil and dry grated coconut were purchased from local market, EL-Mansoura, Egypt.

### Chemicals

All chemicals were obtained from Micro-Analytical Unit, Damietta University, New Damietta City, Damietta Governorate, Egypt.

### Methods

#### Preparation of un-pollinated date powder

Un-pollinated date were washed under running tap water then cut to thin slices and dried in air oven (Treviso., Italy) at 70 °C for 8 hours then the date were ground into powder using (Mienta Grinder., Egypt) to pass through sieved 120 mesh and stored at 3-5 °C in sealed polyethylene bags until use (Ibrahim *et al.*, 2017).

#### Cupcake preparation

Cupcake was prepared according to the method described by Jesmin *et al.*, (2016) with a simple change was applied in cupcake preparation. Ingredients were weighed exactly then egg was blended with vanilla and sugar until got smooth like cream by using a mixing machine (Mienta BT-BM1., Egypt) then oil added to the mixture. Flour, baking powder and milk powder were stirred together and added to previous mixture. The mixtures were whipped until got smooth. Butter was smeared on cupcake wrap and the dough was baked at 140°C for 30 minutes then cooled at room temperature and stored after packaging with polyethylene bags at refrigerator until analysis. Un-pollinated date powder was replaced wheat flour at levels of 5, 10 and 15% to give three mixtures as presented in Table (I).

**Table (I) Cupcake formula preparation on 100 g flour basis**

Ingredients (g)	Control	Samples		
		A	B	C
Wheat flour	100	95	90	85
Un-pollinated date powder	0	5	10	15
Sugar	83	83	83	83
Egg*	2	2	2	2
Baking powder	3	3	3	3
Milk powder	34	34	34	34
Vanilla	2	2	2	2
Oil (ml)	50	50	50	50

\*number of egg

#### Preparation of un-pollinated date and coconut milk drink

Un-pollinated date and coconut milk drink was prepared with some modifications according to the method of Belewu *et al.*, (2014).

#### Coconut milk preparation

About 900 ml of hot water was added to 60 gm grated coconut for 10 minutes to extract milky colour content then was blended with a blender and filtered by strainer followed by adding (40) gm sugar. (Belewu *et al.*, 2014)

#### Un-pollinated date juice preparation

About 900 ml of hot water was added to 80 gm un-pollinated date powder for 10 minutes to extract date colour content then was blended with a blender and filtered by strainer followed by adding (40 gm sugar) (Belewu *et al.*, 2014).

#### Un-pollinated date-Coconut Drink formula

**Table II: The formulas used for the preparation of un-pollinated date-coconut drink**

Drink samples	Coconut milk %	Un-pollinated date juice %
Control	0	100
A <sub>1</sub>	50	50
B <sub>1</sub>	75	25
C <sub>1</sub>	25	75

A<sub>1</sub>, B<sub>1</sub>, C<sub>1</sub> : different formula used in drink preparation

Un-pollinated date juice was mixed with coconut milk then stored at (3-5 °C) until analysis were carried out.

### Analytical Methods

#### Proximate chemical analysis

Total acidity was measured according to the method of Ranganna (1977). pH value was determined by using PH meter (Hanna HI 2211., Romania) at 25°C. Moisture, ash, fat and crude protein were measured according to the methods of A.O.A.C. (2010). Total carbohydrate was determined by difference (100 – (moisture + ash + protein + fat)). Minerals were determined by using Atomic absorption spectrometer (Pin AAcle 500 – Perkin Elmer – U.S.A) according to the method of American Public Health Association (1992).

#### Determination of Bioactive compounds

##### Determination of total phenolic contents

Total phenolic contents were measured with some modifications according to the method of (Ivanova *et al.*, 2010). An aliquot of the methanolic extract was raised to 1 ml with distilled water in test tubes and 3.5 ml of 0.2 N Folin-Ciocalteu reagent were added. After 3-5 min., 2.5 ml

of 7.5% Na<sub>2</sub>CO<sub>3</sub> solution were added and the mixture was incubated at 45 °C for 15 min., then cooled to room temperature and absorbance of the resulting blue colour of the reduced chromophore was measured at 765 nm using spectrophotometer. Free phenolics were expressed as mg gallic acid equivalent gram-1 of DW.

#### Determination of total flavonoids

Flavonoids were assayed in the methanolic extract with some modifications according to the method adopted by (Yang., 2009). An aliquot of the methanolic extract was raised to 1 ml with distilled water in test tubes followed by addition of 0.3 ml of 5% solution of NaNO<sub>2</sub>. The mixture was mixed well and allowed to stand for 6 min. at room temperature, followed by the addition of 0.3 ml of 10% solution of AlCl<sub>3</sub>. The mixture was allowed to stand for 5 min. before the addition of 1 ml of 1 M NaOH and the contents were thoroughly mixed and allowed to stand for 15 min. and absorbance was read at 510 nm against the reagent blank. Flavonoid contents were expressed as mg quercetin equivalent gram-1 of DW.

#### Determination of total Tannins

Tannins were measured according to the method of AL-Dallaly and AL-Hakeem (1987). Extract 0.5 gm of sample in 25 ml of distilled water on a boiling water bath for 30 minutes, then centrifuge the mixture at 2,000 r.p.m. for 20 minutes, then transfer the filter to volumetric flask 100 ml and then complete the volume to mark with Distilled water then add to a solution 20 mL of lead acetate solution 4% with constant shaking for one hour after which the solution is filtered with Datman filter paper then the precipitate was transferred to a ceramic eyelid and dried in an oven at 105 °C for one hour then the eyelid weight T1 then burnt the model in a muffle at a temperature of 500C, then the eyelid weight T2 again and calculate the percentage of Tannins on the dry weight of the equation:

$$\% \text{ Tannins} = ((T1-T2) / \text{model weight}) * 100$$

#### Sensory Evaluation

In order to evaluate the product characteristics and to access what differences of the product would collect better sensory evaluation for various mixtures of cake was estimated. Taste, odor, texture, crust color, crumb color, appearance, and overall acceptability of un-pollinated date cake Awad and Shokry., (2018) and also taste, flavor, texture, colour and overall acceptability of un-pollinated date-Coconut drink Belewu *et al.*, (2014) were estimated by ten panelists (1 = extremely disliked, 10 = extremely liked) in sensory evaluation form.

#### Statistical analysis

Obtained data were analyzed statistically by (ANOVA) with Completely Randomized Design using Microsoft excel 2010 Software (version 14.0.6023.1000). The means were compared using least significant differences (LSD) at the 5% significance level.

### Results and Discussion

#### Proximate Physico-chemical properties of un-pollinated date powder

The results in Table (1) showed the Physico-chemical properties of un-pollinated date powder. The data was displayed that the moisture, total solids, ash, total acidity, pH value, fat, protein and total carbohydrates of un-pollinated

date powder were 8.01, 91.99, 3.08, 0.14, 5.28, 0.78, 1.65 and 86.48%; respectively. Ibrahim *et al.*, (2018) were reported that the Physico-chemical properties of un-pollinated date powder and they found that the moisture, total solids, ash, total acidity and pH value of un-pollinated date powder were 7.63, 92.36, 2.29, 0.15% and 5.45; respectively. Kenawi *et al.*, (2016) were studied the chemical characteristics of El Sakkoti powder and reported that the moisture, ash, Protein, Crude fat and total carbohydrates on dry weight basis were 4.43, 1.40, 1.62, 1.62 and 91.62%; respectively. Whereas, for Tamr El wadi date powder was 5.26, 1.35, 1.58, 1.58 and 91.87%; respectively.

**Table 1. Physico-chemical properties of un-pollinated date powder.**

Characteristics	%
pH Value	5.28 ± 0.035
Total Acidity (as malic acid)	0.14 ± 0.006
Total Solids (TS)	91.99 ± 0.006
Moisture	8.01 ± 0.006
Protein	1.65 ± 0.010
Fat	0.78 ± 0.055
Ash	3.08 ± 0.020
Total Carbohydrate	86.48 ± 0.085

\*Mean value ± Standard deviation of three replicates.

\* All Chemical properties measured on dry weight basis (DWB) expect total solids which measured by difference (100 - % moisture) and total carbohydrate (100 - (%moisture + %ash + %protein + %fat)).

#### Mineral content of un-pollinated date powder

The results in Table (2) displayed the mineral content of un-pollinated date powder. The data showed that the sodium, potassium, calcium, magnesium, zinc and iron of un-pollinated date powder were (193, 599, 232, 61, 0.07 and 1 mg/100g; respectively). Mineral content of un-pollinated date powder were reported by Ibrahim *et al.*, (2017) who noticed that potassium considered as the highest amount of mineral content by 807.538 mg/100g, thus it may have helpful for dominance of high blood pressure while the lowest amount being 0.375 mg/100g for zinc. The antioxidant enzymes (glutathione peroxidase, catalase and superoxide dismutase) needed micronutrient cofactors for example zinc and iron for activity (Duthie and Brown, 1994).

**Table 2. Mineral content of un-pollinated date powder per mg/100g (on dry weight basis).**

Minerals	mg/100g
Na	193
K	599
Ca	232
Mg	61
Zn	0.07
Fe	1

#### Bioactive compounds of un-pollinated date powder

From data in Table (3), it can be seen that total phenolic compounds, total flavonoid compounds and total tannins were (78.61, 277.14 mg/g and 29.82%; respectively) of un-pollinated date powder on dry weight basis. The concentration of polyphenols in this work was agreement with work of (Masmoudi-Allouche *et al.*, (2016) who found that the total phenols of Deglet Nour, Ruchdi, Ftimi and Kentichi dates in methanol extracts were (65.18, 80.37, 73 and 74.51 mg GAE/g DW; respectively).

**Table 3. Bioactive compounds of un-pollinated date powder.**

Bioactive compounds	mg/g
Total phenolic compounds (as gallic acid) (on DWB)	78.61 ± 1.99
Total flavonoid compounds (on DWB)	277.14 ± 6.07
Total tannins (%)	29.82 ± 0.04

\*Mean value ± Standard deviation of three replicates.

\* All items measured on dry weight basis (DWB).

### Proximate Physico-chemical characteristics of prepared cupcake with different ratio of un-pollinated date powder

The Physico-chemical characteristics of prepared cupcake with different ratio of un-pollinated date powder was presented in Table (4). The results displayed that there was

an increase in the moisture and ash content with the addition of un-pollinated date powder and the amount of total carbohydrates were decreased in cupcakes prepared from un-pollinated date powder. These results were in agreement with those reported that by Kenawi *et al.*, (2016). Results also in the same Table showed that a decrease in pH and titratable acidity values as the quantity of un-pollinated date powder increases. Also results showed that the highest protein (2.46%) and fat (20.76%) were found in sample B which contained (10% un-pollinated date powder) and the lowest value of protein (0.83%) was observed in sample (control) and fat (12.96%) was found in sample A contained (5% un-pollinated date powder). The lowest protein in un-pollinated date powder resulted lower protein in un-pollinated date cakes. These results were in line with Jesmin *et al.*, (2016).

**Table 4. Physico-chemical characteristics of prepared cupcake with different ratio of un-pollinated date powder.**

Characteristics (%)	Control	Cupcake samples			LSD <sub>0.05</sub>
		A	B	C	
pH Value	7.74 ± 0.006 <sup>a</sup>	7.61 ± 0.015 <sup>b</sup>	7.33 ± 0.015 <sup>c</sup>	7.32 ± 0.01 <sup>c</sup>	0.023
Total Acidity (as malic acid)	0.016 ± 0.003 <sup>a</sup>	0.012 ± 0.002 <sup>b</sup>	0.010 ± 0.00 <sup>b</sup>	0.006 ± 0.00 <sup>c</sup>	0.004
Total Solids (TS)	83.65 ± 0.43 <sup>b</sup>	84.31 ± 0.67 <sup>b</sup>	84.15 ± 0.70 <sup>b</sup>	82.32 ± 0.23 <sup>a</sup>	1.024
Moisture	16.35 ± 0.43 <sup>b</sup>	15.69 ± 0.67 <sup>b</sup>	15.85 ± 0.70 <sup>b</sup>	17.68 ± 0.23 <sup>a</sup>	1.024
Protein	0.83 ± 0.00 <sup>c</sup>	1.67 ± 0.01 <sup>b</sup>	2.46 ± 0.035 <sup>a</sup>	1.67 ± 0.01 <sup>b</sup>	0.036
Fat	20.30 ± 2.50 <sup>a</sup>	12.96 ± 0.08 <sup>b</sup>	20.76 ± 0.02 <sup>a</sup>	20.15 ± 0.76 <sup>a</sup>	2.47
Ash	2.01 ± 0.06 <sup>b</sup>	1.90 ± 0.07 <sup>b</sup>	1.91 ± 0.036 <sup>b</sup>	2.48 ± 0.096 <sup>a</sup>	0.13
Total Carbohydrate	60.51 ± 2.22 <sup>b</sup>	67.85 ± 0.76 <sup>a</sup>	59.04 ± 0.71 <sup>bc</sup>	58.01 ± 0.77 <sup>c</sup>	2.42

\*Mean value ± Standard deviation of three replicates; mean values with different superscripts in a row indicate significantly differences ( $p \leq 0.05$ ) using LSD test.

\* All Chemical properties measured on dry weight basis (DWB) except total solids which measured by difference (100 - % moisture) and total carbohydrate (100 - (%moisture + %ash + %protein + %fat)).

\* A= cupcake with 5% un-pollinated date powder, B= cupcake with 10% un-pollinated date powder, C= cupcake with 15% un-pollinated date powder.

### Mineral content of prepared cupcake with different ratio of un-pollinated date powder

Data in Table (5) showed that the minerals content of prepared cupcake with (5, 10 and 15%) un-pollinated date powder and it was displayed that sample A (5% un-pollinated date powder) had the highest content of sodium and zinc being 766 and 0.8 mg/100g and sample (control) had the highest content of potassium, calcium and magnesium (498, 199 and 24 mg/100g; respectively) while sample B (10% un-pollinated date powder) had the lowest content of zinc and iron (0.3 and 0.6 mg/100g; respectively) and sample C (15% un-pollinated date powder) had the lowest content of potassium, calcium and magnesium (219, 99 and 0.2 mg/100g; respectively). Zinc is a major and healthy mineral for our bodies because it is helpful to produce testosterone as essential for function of the male sexual system Ali *et al.*, (2007), this mineral is the highest in sample A (5% un-pollinated date powder). Iron is an essential element because it collaborates in metabolic processes, including oxygen transport, deoxyribonucleic acid (DNA) synthesis, and electron transport Abbaspour *et al.*, (2014), and this element is the highest in all samples except sample B (10% un-pollinated date powder).

**Table 5. Mineral content of prepared cupcake with different ratio of un-pollinated date powder.**

Minerals (mg/100 g)	Control	Cupcake samples		
		A	B	C
Na	224	766	561	256
K	498	307	445	219
Ca	199	132	165	99
Mg	24	5	18	0.2
Zn	0.6	0.8	0.3	0.7
Fe	1	1	0.6	1

### Bioactive compounds of prepared cupcake with different ratio of un-pollinated date powder

From obtained results in Table (6) it was observed clearly an increase in total phenolic compounds which recorded from 4.94 mg/g in control sample to 6.04 mg/g in sample C (cupcake with 15% un-pollinated date powder). The highest content of total flavonoid compounds was 24.86 mg/g in control sample followed by samples B, A and C (cake with 10, 5 and 15% un-pollinated date powder) which recorded 24.22, 22.59 and 20.30 mg/g; respectively. Decreasing of % total tannins from 31.44% in control sample to 26.14% in sample C. The total phenolic content were also found in the cake without un-pollinated date powder because total phenolic content, essentially ferulic acid were found in wheat flour (Beta *et al.* 2005) and products of Maillard reaction created during baking (González-Mateo *et al.* 2009).

**Table 6. Bioactive compounds of prepared cupcake with different ratio of un-pollinated date powder.**

Bioactive compounds	Control	Cupcake samples			LSD <sub>0.05</sub>
		A	B	C	
Total phenolic compounds (as gallic acid) (mg/g) (on DWB)	4.94 ± 0.37 <sup>c</sup>	5.81 ± 0.39 <sup>a</sup>	5.91 ± 0.35 <sup>ab</sup>	6.04 ± 0.45 <sup>a</sup>	0.74
Total flavonoid compounds (mg/g) (on DWB)	24.86 ± 0.46 <sup>a</sup>	22.59 ± 1.35 <sup>b</sup>	24.22 ± 0.09 <sup>a</sup>	20.30 ± 0.94 <sup>c</sup>	1.61
Total tannins %	31.36 ± 0.11 <sup>a</sup>	31.44 ± 0.08 <sup>a</sup>	30.48 ± 0.01 <sup>b</sup>	26.14 ± 0.07 <sup>c</sup>	0.15

\*Mean value ± Standard deviation of three replicates; mean values with different superscripts in a row indicate significantly differences ( $p \leq 0.05$ ) using LSD test.

\* All Chemical properties measured on dry weight basis (DWB).

\* A= cupcake with 5% un-pollinated date powder, B= cupcake with 10% un-pollinated date powder, C= cupcake with 15% un-pollinated date powder.

#### Physico-chemical characteristics of prepared un-pollinated date-Coconut Drink with different ratio of un-pollinated date powder

Data in Table (7) displayed that moisture content increased from (88.63%) in control sample to (88.79%) in sample C<sub>1</sub>. This results was similar to those reported by Belewu *et al.*, (2014) who observed that the moisture content of coconut milk drink was (88.65%) and the moisture of date juice was (87.10%). The highest ash and fat content were 0.46% and 0.45%, respectively and were found in sample C<sub>1</sub> (25% Coconut milk and 75% Un-pollinated date juice). This result was agreement with Belewu *et al.*, (2014) who observed an increase in the percentage of fat by increasing the proportion of added coconut milk.

Also in the same Table (7), it could be noticed that there was a decrease in acidity from control sample (0.104%) to sample C<sub>1</sub> (0.080%). The highest carbohydrate value (9.19%) and the lowest protein value (1.76%) were observed in sample A<sub>1</sub> (50% Coconut milk and 50% Un-pollinated date juice).

**Table 7. Physico-chemical characteristics of prepared un-pollinated date-Coconut Drink with different ratio of un-pollinated date powder.**

Characteristics (%)	Control	Drink samples			LSD <sub>0.05</sub>
		A <sub>1</sub>	B <sub>1</sub>	C <sub>1</sub>	
PH Value	6.22 ± 0.006 <sup>b</sup>	5.60 ± 0.006 <sup>d</sup>	5.82 ± 0.015 <sup>c</sup>	6.24 ± 0.00 <sup>a</sup>	0.016
Total Acidity (as malic acid)	0.104 ± 0.003 <sup>a</sup>	0.094 ± 0.003 <sup>ac</sup>	0.098 ± 0.015 <sup>a</sup>	0.08 ± 0.007 <sup>c</sup>	0.016
Total Solids (TS)	11.37 ± 0.69 <sup>a</sup>	11.30 ± 0.92 <sup>a</sup>	11.23 ± 0.97 <sup>a</sup>	11.21 ± 0.82 <sup>a</sup>	1.61
Moisture	88.63 ± 0.69 <sup>a</sup>	88.70 ± 0.92 <sup>a</sup>	88.77 ± 0.97 <sup>a</sup>	88.79 ± 0.82 <sup>a</sup>	1.61
Protein	3.50 ± 0.006 <sup>a</sup>	1.76 ± 0.015 <sup>c</sup>	3.50 ± 0.00 <sup>a</sup>	3.08 ± 0.02 <sup>b</sup>	0.024
Fat	0.11 ± 0.01 <sup>b</sup>	0.12 ± 0.025 <sup>b</sup>	0.38 ± 0.03 <sup>a</sup>	0.45 ± 0.20 <sup>a</sup>	0.19
Ash	0.13 ± 0.03 <sup>c</sup>	0.25 ± 0.04 <sup>b</sup>	0.15 ± 0.03 <sup>c</sup>	0.46 ± 0.05 <sup>a</sup>	0.076
Total Carbohydrate	7.14 ± 0.87 <sup>c</sup>	9.19 ± 1.035 <sup>a</sup>	7.17 ± 0.95 <sup>b</sup>	7.71 ± 0.60 <sup>abc</sup>	1.66

\*Mean value ± Standard deviation of three replicates; mean values with different superscripts in a row indicate significantly differences ( $p \leq 0.05$ ) using LSD test.

\*All Chemical properties measured on dry weight basis (DWB) expect total solids which measured by difference (100 - % moisture) and total carbohydrate (100 - (%moisture + %ash + %protein + %fat)).

\*Control= 100% Un-pollinated date juice, A<sub>1</sub>=50% Coconut milk and 50% Un-pollinated date juice, B<sub>1</sub>=75% Coconut milk and 25% Un-pollinated date juice, C<sub>1</sub>=25% Coconut milk and 75% Un-pollinated date juice.

#### Mineral content of prepared un-pollinated date-Coconut Drink with different ratio of un-pollinated date powder per mg/100g (on dry weight basis)

Results in Table (8) showed the minerals content of prepared un-pollinated date-Coconut Drink with different ratio of un-pollinated date powder per mg/100g (on dry weight basis) and it was displayed that control sample (100% Un-pollinated date juice) had the highest content of potassium, calcium and iron (2087, 1168 and 253 mg/100g, respectively) and sample B<sub>1</sub> (75% Coconut milk and 25% Un-pollinated date juice) had the highest content of sodium and zinc (1133 and 74 mg/100g, respectively). Sample C<sub>1</sub> (25% Coconut milk and 75% Un-pollinated date juice) had the highest content of magnesium (688 mg/100I). Date fruit is considered a good source of iron for treating anemia by producing red blood cells. Potassium is decreasing muscle contractions including the heart muscle contraction, safety nervous system and effective metabolism in the body so potassium is an important in our body. Magnesium and calcium are essential elements for healthy bone development and energy metabolism (Appel *et al.*, 1997).

**Table 8. Mineral content of prepared un-pollinated date-Coconut Drink with different ratio of un-pollinated date powder per mg/100g (on dry weight basis).**

Minerals (mg/100 g)	Control	Drink samples		
		A <sub>1</sub>	B <sub>1</sub>	C <sub>1</sub>
Na	409	409	1133	608
K	2087	1713	1639	1782
Ca	1168	690	796	902
Mg	120	672	128	688
Zn	65	64	74	67
Fe	253	86	113	96

#### Bioactive compounds of prepared un-pollinated date-Coconut Drink with different ratio of un-pollinated date powder

Phenolic compounds could be considered as a good protective instrument against many diseases. From results in Table (9), it can be noticed that the highest content of total phenolic compounds, total flavonoid compounds and total tannins were observed in control sample (100% Un-pollinated date juice) which recorded (82.25, 143.83 mg/g and 5.26%, respectively) followed by sample C<sub>1</sub> (25% Coconut milk and 75% Un-pollinated date juice) which recorded (67.45, 104.91 mg/g and 3.60%, respectively). The lowest content of total phenolic compounds, total flavonoid compounds were displayed in sample B<sub>1</sub> (75% Coconut milk and 25% Un-pollinated date juice) which recorded (32.24 and 52.01 mg/g, respectively) and the lowest content of total tannins was observed in sample A<sub>1</sub> (50% Coconut milk and 50% Un-pollinated date juice) which recorded (1.39%). Decreasing total phenolic compounds, total flavonoid compounds and total tannins in samples A<sub>1</sub> and B<sub>1</sub> due to decrease the percentage of un-pollinated date juice in samples thus un-pollinated date juice is a source of total phenolic compounds, total flavonoid compounds and total

tannins. The average daily requirement for polyphenols is about 1 g / day. All polyphenols are distinguished by the presence in their structure of one or more phenolic groups, able to reduce reactive oxygen types and different organic substrates and minerals. This redox properties prevention of different chronic diseases linked with oxidative stress, for example cardiovascular diseases, cancers, type II diabetes, neurodegenerative diseases or osteoporosis (Pe´rez-Jime´nez et al., 2010).

**Table 9. Bioactive compounds of un-pollinated date-Coconut Drink prepared with different levels of un-pollinated date powder.**

Bioactive compounds	Control	Drink samples			LSD <sub>0.05</sub>
		A <sub>1</sub>	B <sub>1</sub>	C <sub>1</sub>	
Total phenolic compounds (as gallic acid) (mg/g) (on DWB)	82.25 ± 9.04 <sup>a</sup>	48.33 ± 1.31 <sup>c</sup>	32.24 ± 1.47 <sup>d</sup>	67.45 ± 2 <sup>b</sup>	8.93
Total flavonoid compounds (mg/g) (on DWB)	143.83 ± 9.48 <sup>a</sup>	93.93 ± 2.81 <sup>c</sup>	52.01 ± 3.16 <sup>d</sup>	104.91 ± 2.59 <sup>b</sup>	10.05
Total tannins %	5.26 ± 0.04 <sup>a</sup>	1.39 ± 0.04 <sup>d</sup>	2.13 ± 0.02 <sup>c</sup>	3.60 ± 0.03 <sup>b</sup>	0.07

\*Mean value ± Standard deviation of three replicates; mean values with different superscripts in a row indicate significantly

**Table 10. Sensory evaluation of prepared cupcake with different ratio of un-pollinated date powder.**

Cake samples	Taste	Odor	Texture	Crust Colour	Crumb Colour	Appearance	Overall acceptability
Control	9.5 <sup>a</sup>	8.6 <sup>a</sup>	8.7 <sup>a</sup>	9.5 <sup>a</sup>	9.5 <sup>a</sup>	9.5 <sup>a</sup>	9.2 <sup>a</sup>
A	8.6 <sup>ab</sup>	8.8 <sup>a</sup>	8.7 <sup>a</sup>	8.4 <sup>ab</sup>	8.8 <sup>ab</sup>	8.6 <sup>ab</sup>	8.3 <sup>ab</sup>
B	8 <sup>b</sup>	8 <sup>a</sup>	8 <sup>ab</sup>	7.6 <sup>bc</sup>	7.5 <sup>bc</sup>	7.4 <sup>bc</sup>	7.6 <sup>bc</sup>
C	7.8 <sup>b</sup>	7.8 <sup>a</sup>	7.3 <sup>b</sup>	6.9 <sup>c</sup>	6.9 <sup>c</sup>	6.8 <sup>c</sup>	7.1 <sup>c</sup>
LSD at 5%	1.44	1.45	1.40	1.43	1.31	1.25	1.10

\*Mean with the same superscripts are not significantly different from each other along the column (p≤0.05).

#### Sensory evaluation of prepared un-pollinated date-Coconut Drink with different ratio of un-pollinated date powder

Organoleptic evaluation considered as necessary index of potential consumer preferences. Data of organoleptic evaluation involve taste, flavour, juiciness, colour and overall acceptability are given in Table (11). Results in Table (11), indicate that sample B<sub>1</sub> included 75% Coconut milk and 25% un-pollinated date juice had the highest parameters for taste, flavour, juiciness, colour and overall acceptability recorded (8.4,8.7,8.8,8.7 and 8.8 scores, respectively) while control sample included 100% un-pollinated date juice had the lowest parameters for taste, flavour, juiciness, colour and overall acceptability which recorded (6.2,6, 6.8, 6.7 and 6.4 scores, respectively). The differences in ratings for taste, flavour, colour and overall acceptability between samples A<sub>1</sub>, B<sub>1</sub> and C<sub>1</sub> are not significant differences (p≤0.05).

**Table 11. Sensory evaluation of prepared un-pollinated date-Coconut Drink with different ratio of un-pollinated date powder.**

Drink samples	Taste	Flavour	Juiciness	Colour	Overall acceptability
Control	6.2 <sup>b</sup>	6 <sup>b</sup>	6.8 <sup>b</sup>	6.7 <sup>b</sup>	6.4 <sup>b</sup>
A <sub>1</sub>	7.7 <sup>a</sup>	7.7 <sup>a</sup>	8.4 <sup>a</sup>	8.3 <sup>a</sup>	8.3 <sup>a</sup>
B <sub>1</sub>	8.4 <sup>a</sup>	8.7 <sup>a</sup>	8.8 <sup>a</sup>	8.7 <sup>a</sup>	8.8 <sup>a</sup>
C <sub>1</sub>	7.5 <sup>a</sup>	7.9 <sup>a</sup>	7.9 <sup>ab</sup>	8 <sup>a</sup>	7.9 <sup>a</sup>
LSD at 5%	1.10	1.12	1.16	1.23	1.08

differences (p ≤ 0.05) using LSD test.

\*Control= 100% Un-pollinated date juice, A<sub>1</sub>=50% Coconut milk and 50% Un-pollinated date juice, B<sub>1</sub>=75% Coconut milk and 25% Un-pollinated date juice, C<sub>1</sub>=25% Coconut milk and 75% Un-pollinated date juice.

#### Sensory evaluation

##### Sensory evaluation of prepared cupcake with different ratio of un-pollinated date powder

The average sensory scores for cakes prepared from wheat and un-pollinated date flour at different levels are presented in Table (10). Cupcake prepared from wheat flour (control) had the highest ratings for taste, crust colour, crumb colour, appearance and overall acceptability. Cupcake made from wheat flour and un-pollinated date flour had the highest preference in odor and the differences for odor are not significant (p≤0.05) in sample A (5% un-pollinated date flour) which recorded 8.8 scores. Cupcake produced from wheat flour and un-pollinated date flour had the least ratings for taste, odor, texture, crust colour, crumb colour, appearance and overall acceptability, respectively in sample C (15% un-pollinated date flour) which recorded 7.8, 7.8, 7.3, 6.9, 6.9, 6.8 and 7.1 scores, respectively.

\*Mean with the same superscripts are not significantly different from each other along the column (p≤0.05).

#### Conclusion

Data of the present study showed that un-pollinated date is a good source of nutritional value, bioactive compounds and mineral contents. Cakes and drinks prepared from un-pollinated date also displayed a good bioactive compounds and minerals. So, this study recommended to use un-pollinated date powder in different food industries.

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