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Nutritional and Chemical Composition of Saidy Date Pits (*Phoenix dactylifera L.)*

M. A. Sorour[1]; B.R. Ramadan[2]; A. E.Mehani[1] and Naglaa Abdel-Sabour[3*]
[1]Food Sci. &Nut.Dept., Fac. of Agric. Sohag University, Egypt.
[2]Food Sci.& Tech. Dept., Fac. of Agric. Assiut University, Egypt
[3]Food Sci. & Dairy Dept., Fac. of Agric. South Valley Univ., Egypt

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Abstract

Physical and chemical properties of Saidy date (*Phoenix dactylifera L.)* seeds from Saidy date samples were evaluated. Moisture, protein, oil and carbohydrates contents were 2.85, 13.31, 12.12 and 70.95 % date pits, respectively. The glucose fractions of date seeds was 10.46g/100g.Maltose recorded the highest value among disaccharides, Ribose was found at a low concentration of (0.95 mg/100g). Moreover, fifteen amino acids were detected in Saidy date seeds amino acid profiles revealed that contained the majority of essential amino acids: lysine, isoleucine, leucine, methionine, threonine, valine and phenylalanine. Lysine was the major amino acid of total amino acids. There are twenty-four phenolic acids were identified in date seeds among them. Pyrogallol proved the highest value (3475.95ppm). Moreover, hesperidin (56.63 mg/100g) was the highest compared with other flavonoids compounds .The most abundant fatty acids of date seeds oil were oleic, lauric, myristic, palmitic, linoleic and stearic acids.

INTRODUCTION

The date palm (*Phoenix dactylifera L.)* is one of the most economically important Fruit tree grown in Egypt. Production of Egypt alone represent about 20% of the total world production at 2012 (**Bekheet, 2013** and **FAO, 2012**).Dates are rich in certain nutrients and provide a good source of rapid energy due to their high carbohydrates content (70 – 80%). Most of the carbohydrates in dates are in the form of fructose and glucose, which are easily absorbed by the human body (**Myhara** *et al.* **1999; Al-Farsi** *et al.***2005** and **Mrabet***et al.* **2008)**.

Pericarp is an edible part and a pit is considered a waste or by–product and which represents about 11-18% of the date fruit weight. A large quantity of date seeds could be easily collect from the date processing factories [**Almana and Mahmoud, 1994** and **Shams-Ardekani** *et al.,* **2010**). Approximately 720,000 tons of date–pits could be produced

*corresponding auther, e-mail: n_naglaa_100@yahoo.com

annually (i.e. considering 10% of the total fruit mass). Each year, 1.3 billion tons of different type's food wasted throughout the supply chain could feed as many as two billion people without any additional impact on the environment as identified by FAO (**Besbes***et al.*, **2004** and **Scott–Thomas, 2013**).

Date–pits are rich sources for nutritive substances (proteins, fats), dietary fiber, bioactive compounds, and polyphenols. Date–pits are considered as waste and have shown high potential to be used as a source of ingredients for food products, for the extraction of bioactive compounds with health functionality (**Hossain** *et al.,* **2014)**.

Date pits can also ground and adde to the feed of some animals. In addition, date pits are used in making a caffeine-free drink that can substitute for non-caffeinated coffee when coffee-related flavor is desired. Such a drink has been used in the Arab world for centuries. A commercial product (date pits powder used as a coffee substitute) has also been introduced recently to the market (**Rahman** *et al.* **2007**).Date seed oil has been used to replace the portions of other vegetable oils in body creams, shampoos, and shaving soap formulations, and, in general, the quality of these cosmetic formulations is encouraging (**Devshony***et al.,***1992**). The aim of this study was to determine the nutritional value, proximate analyses, fatty acid composition, sugar contents and bioactive properties of Siwi date seeds provided from Kharja Date Packing Factory.

MATERIALS AND METHODS:

Materials

Date pits used in this study were obtained from Kharja Date Packing Factory, as a by- product of Saidy date Manufacturing .Date pits were separately ground to powder form by grain crusher machine.

Physical properties of date seed:

Determination of seed dimensions (length (L), width (W) and Thickness (T) were carried with a digital caliper to an accuracy of 0.1 mm. Seed weight in grams were determined using an electrical balance. Geometric mean diameter (Dg), Fruit volume was determined according to the method applied by **Jahromi** *et al.,* **(2007)**. Individual fruits were submerged into a measuring cylinder containing distilled water and the volume of water displaced was recorded. Fruit density (g/cm3) the average whole fruit density was determined as

*corresponding auther, e-mail: n_naglaa_100@yahoo.com

average fruit weight/ average fruit volume.

Chemical analyses of date seeds:

Moisture determination

Moisture in date palm seed was measured using AOAC Method No. 925.10 (**AOAC, 1995**).

Sugars content and Identification of Saccharides

Reducing sugars and total sugars were estimated by Lan and Eynon method according to (**AOAC, 2000**).Extraction, purification and identification of saccharides in date seeds were carried out by HPLC according to **Yan** *et al*, **2014.**

Crude protein and amino acids:

The nitrogen content was analyzed using the standard Kjeldahl procedure (**AOAC, 2000**).Protein content was determined by multiplying the nitrogen content by 6.25 according to **Merrill and Watt (1973).**While amino acids were determined using Automatic Amino Acid Analyzer (AAA 400INGOS Ltd). Hydrolysis of total amino acids.Acid hydrolysis was carried out according to the method of **Csomos and Simon-Sarkadi (2002**).Free amino acids extraction was carried out according to the method of **Shalabia (2011).**

Ash Content:

The ash content was measured according to AOAC method No. 923.03
(**AOAC, 1995)**.

Fat Content:

The total fat content was determined in accordance with the **AOAC (2000**) method.

Crude Fiber Content

Crude fibers were determined according to **AOAC (2000)**

Total Carbohydrates:

Total carbohydrates in date seeds were calculated by difference rather than direct analysis according to the FAO method (**FAO, 2003**).

Identification of phenolic compounds date pits:

Phenolic compounds determined by HPLC according to **Goupy** *et al.*, **1999**.

Identification of flavonoids:

Determination, identification and quantification of flavonoids were carried
out by HPLC according to (**Mattila** *et al.*,**2000**).

Determination of fatty acids composition:

Fatty acids methyl esters were prepared according to ES, Iso 5508 (1990), subsequently Fatty acids composition was analyzed by Gas chromatography (GC) as described by **Cert** *et al.* **(2000).**

*corresponding auther, e-mail: n_naglaa_100@yahoo.com

RESULTS AND DISCUSSION

Physical properties and chemical composition of date seed:

Data of physical and chemical analysis of Saidy date seeds are given in Table (I). The mean weight of date pits was 1.35g this result is higher than those reported by **Abd-Ellah**, **2009** and **Herchi** *et al.*, **2014.** They found the weight of six seed date varieties ranged between 0.84 and 1.2g on dry weight basis. Regarding date's seed length, it was 2.17cm and this results lower than those registered by **Herchi** *et al.*, **2014**, while it was higher than those recorded by **Abd-Ellah, 2009**.

Table (1): Physical properties and chemical composition of Saidy date seed.

Physical properties	Date seed	Chemical	Percentage %
Weight of pit(g)	1.35±0.098	Moisture	2.85±0.141
No/kg	746±0.197	Crude Protein	13.31±00.15
Length (cm)	2.17±0.085	Crude Fat	12.12±00.054
Width (cm)	0.37±0.048	Ash	3.62±0.005
Volume (cm3)	1.89±00.038	Crude Fiber	11.76±0.00
Density (g/cm3)	0.78±0.115	Carbohydrates	70.95±0.00

Physical properties of the studied date pits also showed that, values of seeds number No/kg, volume and density were 746, 1.89cm3 and 0.78g/cm, respectively. Data of chemical composition showed that it contained 2.86 % moisture, 12.12% crude fat, 13.31% crude protein and ash 3.62% of dry matter. Total carbohydrates content was calculated as 70.95%. From the obtained data (Table, 1) it was clear that, Saidy seeds recorded high amount of crude protein, low in moisture and fat level compound in the same trained with that recorded by Besbes *et al.*, 2004. They found that two Deglet Nour and Allig seeds grown in Degach Tunisia found that the chemical composition of the seed varies between 9.40% and 8.60% for moisture,5.56% and 5.17% for protein and10.19% and 12.67% for fat. The differences of date seeds chemical composition may be attributed to the variability of the studied cultivars and also to the variability of the climatic conditions. Concerning the ash content and crude fiber, the ash content higher than that reported by (Chaira *et al.*, 2007 and AL-Suwaiegh, 2016)but lower than those found by Ramadan, (1995), and in agreement with AL Juhaim *et al.*, (2012).

*corresponding auther, e-mail: n_naglaa_100@yahoo.com

Phenolic and flavonoids compounds:

The HPLC analysis of total phenolic contents ppm of Saidy date pits (Table,2) showed that the pyrogallol recorded the highest value among the phenol compound 3475.95, followed catechein 665.14,epicatechein347.66,e-vanillic 283.74,P-OH-benzoic245.51, protocatchuic135.60,gallic133.19, Benzoic123.72.While 4-Amino benzoic, chlorogenic, catechol, caffeine, caffeic, vanillic, P-coumaric, ferulic, Iso-ferulic, reversetrol, ellagic, Alpha-coumaric, 3,4,5-methoxy-cinnamic, coumarin, salycillic and cinnamic, recorded the value under

Table (2): Phenolic compounds and flavonoids in Saidy date pits.

Phenolic compounds	**ppm**	**Flavonoids**	**mg/100g**
Gallic	133.19	Luteolin	3.03
Pyrogallol	3475.95	Narengin	3.07
4-Amino-benzoic	38.70	Rutin	1.93
Protocatchuic	135.60	Hisperidin	56.62
Catechein	665.14	Rosmarinic	1.49
Chlorogenic	30.12	quercetrien	2.35
Catechol	42.00	Quercetin	1.39
Epicatechein	347.66	Hispertin	1.33
Caffeine	42.61	Kampferol	0.58
P-OH-benzoic	245.51	Apegnin	0.42
Caffeic	22.86	7-Hydroxyflavone	0.003
Vanillic	34.69	--	
P-coumaric	9.72	--	
Ferulic	31.53	--	
Iso-ferulic	19.73	--	
Reversetrol	3.52	--	
Ellagic	15.98	--	
e-vanillic	283.74	--	
Alpha-coumaric	12.65	--	
Benzoic	123.72	--	
3,4,5-methoxy- cinnamic	10.53	--	
Coumarin	3.85	--	
Salycillic	70.98	--	
Cinnamic	3.77	--	

Moreover, results in Table(2) showed that hisperidin content recorded the highest value (56.62mg/100g) compared the other flavonoids content; followed by luteolin give the second value 3.03 mg /100g/100g.While7hydroxyflavone gives the lowest value 0.0032mg /100g .The present results are in

*corresponding auther, e-mail: n_naglaa_100@yahoo.com

line with the previous findings of **Al-Farsi and Lee (2008)**.They deduced that date pit contains 0.28 mg/100 g gallic acid, 8.84 mg/100g protocatechuic acid, 9.89 mg/100 g p-hydroxybenzoic acid, 4.07 mg/100 g vanillic acid, 0.18 mg/100 g caffeic acid, 6.07 mg/100 g p-coumaric acid, 6.93 mg/100g ferulic acid, 8.42 mg/100 g m-coumaric acid, 3.96 mg/100 g o-coumaric acid.

Sugar and fatty acid profile:

Table (3) presents the total, reducing and non-reducing sugars of Saidy date seeds were 29.55%, 18.61% and 10.82%,
respectively. Moreover the glucose fractions of date seed was 10.46 mg/100g .Maltose recorded the highest value among disaccharides and in the second value from all sugars fractions. Moreover, ribose content (0.95mg/100g) of seeds was the lowest. These results are higher than those reported by **AL Juhaimi et** *al.*, **2012** and **Chaira** *et al.*, **2007**.due to the date pits don't washed before the ground and reside some of date flesh in pits. Data in Tables (3) also showed that most abundant fatty acids of date seed oils were oleic, lauric, myristic, palmitic, linoleic and stearic acids which were (44.02, 18.63, 10.55, 10.37, 10.28 and 3.15%), respectively .The results were in the same line with those reported by **(Akbari** *et al*.**2012)**. They found that oleic acid was the primary fatty acid in three varieties followed by, lauric, myristic, palmitic, linoleic and stearic acids.

Table (3): Sugar and Fatty acid profile of Saidy date Pits.

Compounds		**Fatty acids (FA)**	**% of total FA**
Total Sugar	29.55 %	Caprylic (C 8:0)	0.26
Reducing	18.61	Capric C10:0	0.34
Non –Reducing	10.82	Lauric (C 12:0)	18.63
Glucuronic	35.27mg/100g	Myristic (C14:0)	10.55
Stachyose	67.96	Palmitic (C 16:0)	10.37
Galacturonic	355.17	Palmitoleic (C16:1)	0.14
Raffinose	100.89	Heptadecounic C17:0	0.07
Sucrose	155.67	C17:1	0.05
Maltose	2790.73	Stearic (C 18:0)	3.15
Lactose	314.01	Oleic (C 18:1)	44.02
Glucose	10464.90	C18:2T	0.33
Xylose	316.11	Linoleic (C 18:2)	10.28
Mannose	105.09	Arachidic (C 20:0)	0.41
Manitol	10.39	Gadoleic (C 20:1)	0.42

*corresponding auther, e-mail: n_naglaa_100@yahoo.com

Ribose	0.95	Behenic (C 22:0)	0.22
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Amino acids content:

Figure (1) illustrated the amino acid composition of the Saidy date seeds. The data showed that fifteen types of amino acids were detected and identified. lysine (Lys) was the predominant amino acid 18.58, followed by Glutamic acid (Glu) 14.40, aspartic acid (Asp) 11.51, alanine (Ala) 9.57, glycine (Gly) 8.28, leucine (Leu)7.96 g/100g, valin (Val)7.23, Histidin (His) 5.66, Iso Lysine (Ile) 3.92 and phenylalanine (Phe) 2.68 g/100g .The results of amino acids of the studied Saidy date pits compared with then those reported by **Ramadan ,1995** amino acid levels Saidy date pits recorded highest of all amino acid except phenylalanine. These differences might be due to the used method or the season cultivate. While the data agreement with those found by **Salim and Ahmed, 1992** fortwo Saudi Arabian date seeds, the essential amino acids were present in the date seeds studied varieties.

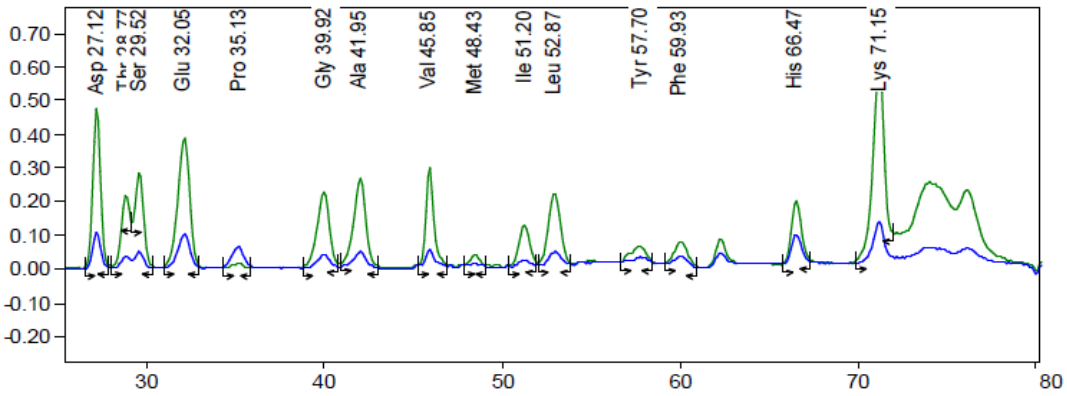

Fig (1): Amino acids composition in Saidy date seed.

CONCLUSIONS:

From the results of the present investigation, it is concluded that date pit is an excellent source of Phenolic compound, Flavonoids, Amino acids and Fatty acid that can serve as an excellent and economical resource of natural antioxidants. It is proposed from this research study that Siwi date pit can be used as a functional food or functional food ingredient.

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