Comparative study on the chemical composition of Saudi Sukkari and Egyptian Swei date palm fruits

Ebtehal Abdulaziz A AlTamim

Nutrition & Food sciences Department, Home Economics College, Princess Nora bint Abdulrahman University, Riyadh, Kingdom of Saudi Arabia.
dr.altamim@hotmail.com

Abstract: Date palm (*Phoenix dactylifera* L.) is the major fruit crop in the Kingdom of Saudi Arabia. Due to the nutritional value of the fruits, Egypt as well as many other countries exited great offers for increasing the date plantations. Saudi Sukkari and Egyptian Swei date samples were collected from the local markets in Saudi Arabia and Egypt for determination of proximate chemical, minerals and vitamins. The study results showed that the Saudi Sukkari sample had the highest percentages of moisture (10.58%), protein (2.39%), fiber (4.23%), fat (3.15%) and ash (2.50%). The highest level of total sugars and T.S.S were in the Egyptian Swei sample (81.49%) and (91.20%) respectively. Acidity of Egyptian sample was (0.48%) and considered to be low in both samples. Also, pH level was high in Saudi Sukkari sample (7.11%). The contents of Cu, Na, Ca, Mg and K were higher in Swei Egyptian sample (94.9, 81.7, 79.62, 66.33 & 55.11mg/100g) then Sukkari Saudi sample (81, 74.6, 75.33, 61.15 & 54.18mg/100g), respectively. The lowest minerals contents were Zn (0.80mg/100g) and Fe (4.35mg/100g) in Saudi sample, comparing to Egyptian dates (0.86mg/100g) and (4.56mg/100g), respectively. In regards of the vitamins (B2, B6, B1 and nicotinic acid were high in Sewi dates (105.18, 59.71, 42.74 and 173.64 ppm) respectively. B12 was high in Saudi Sukkari date with 33.890 ppm. Vitamin C was 10.52 mg/100g in both samples. The differences among this study results could be referred to the samples sources and growth conditions. Dates are good sources of nutrients and advise to be consumed in regular diet system.

[Ebtehal Abdulaziz A AlTamim. **Comparative study on the chemical composition of Saudi Sukkari and Egyptian Swei date palm fruits.** *J Am Sci* 2014;10(6):149-153]. (ISSN: 1545-1003). http://www.jofamericanscience.org. 18

Keywords: Nutrients, date palm fruit- chemical composition.

1.Introduction:

Palm dates (*Phoenix dactylifera*) belong to the botanical family of Arecaceae that grows in subtropical climate areas especially Saudi Arabia and Egypt **(AlBakker, 2002)**. Date fruits are constrictive for uterus after birth, laxative for mucous membranes, useful in cystitis treatment. Also the aqueous extract of dates has a reducible impact on glucose level of blood like the oral reducible chemical medications. Consumption of dates helps to ameliorate cough, firm the infants' gums with teething problems and to delay wrinkle formation **(Bauza, 2002, Al-Qarawi et al., 2004 and Alkaabi et al., 2011).** Since dates have a high value of crude fiber, their consumption helps the digestion process and food absorption. Also, the fiber low intake can lead to certain health conditions like colon cancer, heart disease and diabetes **(Parkin et al, 2005)**.

The dates are ideal food for all age phases, providing the most important essential nutrients like protein (5, 22%), fiber (16, 2%), carbohydrates (62, 5%), fat (8, 49%) and minerals **(Al-Farsi et al, 2005 and Vyawahare et al, 2009)**.

Egyptian dates had the maximum limits of essential nutrients for physical activities. The date palm extract contains useful elements like Ca, K, Mg, P and Fe in percentages of 65%, 521%, 20%, 72% and 2,69% respectively, which are very important for human body and metabolic process in human cells **(El-Sohaimy and Hafez, 2010)**. A study by **Chaira et al., (2007)** indicated that total sugars might be up to 60% of the dry matter weight of flesh of Deglet nour and Alig date palm fruit from Tunisia, while reducing sugars content was higher in Alig. Most of the characteristics moisture, T.S.S, acidity, protein and crude fat values were different among 11 date palm varieties of Riyadh **(Saad et al., 1986)**.

The goal of conducting this study is analyzing and comparing the content of Saudi and Egyptian dates in regards of gross chemical composition, some vitamins and minerals.

Materials and Methods

Materials:

Saudi Sukkari and Egyptian Swei date samples were collected from the local dates markets in Saudi Arabia and Egypt. Both samples were semi dry and selected randomly without any preference to size, shape, color and appearance. All analysis results are the mean values of three readings.

2. Methods:

Laboratory analyses:

Moisture, protein, fiber, total sugar, total soluble solid (T.S.S) and fat values were determined according to the **AOAC, (2007)** while reducing and

non-reducing sugars were determined according to **Somogyi, (1952)**.

Mineral elements (Ca, Fe, Zn, K, Na, Mg, P, Mn and Cu) values were determined using Atomic Absorption Spectrophotometer according to **AOAC, (2007)**. Vitamin C was estimated using High Performance Liquid Chromatography (Hewlett Packard 1010) while B vitamins and nicotinic acid were determined by Reversed-Phase Chromatograph according to **AOAC, (2007) and Radaamidzic et al., (2005)**. Acidity was estimated and calculated as citric acid while pH was determined using Digital meter to read titratable hydrogen ions according to **AOAC, (2007)**.

Calculation of some parameters:

Moisture %, fiber %, Fat % and T.S.S %was calculated by weight as the following:

Moisture % = (Initial sample– dried sample weight /Initial sample) × 100

Fiber % = (sample weight loss noted/ Sample weight) × 100

Fat %= (Weight of fat soluble material/ Sample weight) ×100

T.S.S %= (Dried sample weight/ Sample weight)× 100.

Statistical Analysis

All study results were subject to statistical analysis of Variance (ANOVA) of SAS **(SAS, 1998)** to study the significant differences at ($p \leq 0.05$) among dates samples.

3. Results and discussion

Table (1) compares the nutrients contents of Saudi and Egyptian dates. There were significant differences at $p \leq 0.05$ in percentages of moisture, total sugars, protein, fiber and fat among both samples. The high moisture content was in the Saudi sample (10.58%) then the Egyptian (8.81%). This low result agreed to **(Bamigboye et al., 2010)** that low moisture content signifies the higher dry matter yield and helps the long storage of dates.

The main component of palm dates is total sugars content as reducing and non-reducing sugars. Swei sample had the high value of total sugars (81.49%) then Sukkari sample (77.15%). Also, non-reducing sugar had the same trend as the values were 66.01% and 59.40% in Egyptian and Saudi dates in contrast with reducing sugar as the values were 15.48% and 17.75%, respectively. The low content of sugars in Saudi sample was related to the high level of moisture comparing to the Egyptian Swei sample. These values are less than other researches results of **Al-Shahib and Marshall, 2003** who recorded that flesh of date palm fruits contained high carbohydrates (73.5%) and might be (88%) in some varieties.

The Sukkari sample had the highest value of protein (2.39%) and Swei sample was (1.97%). Also, fiber was higher in Sukkari than Swei dates (4.23%) and (2.77%) respectively, which approved the difference in fiber values depending on the dates source. These values of protein agreed with **Gad et al., 2010; Al-Sawaf, 2011and Akasha et al., 2012** that flesh of Date palm fruit contains (2.3-5.6%) of protein. A study by **Al-Shahib and Marshall, 2002** included 11 dates varieties of Saudi Arabia, Egypt and Iraq mentioned the high percentages of fiber ranged from 6.4 to11.5% according to the variety.

Table (1): Comparison of nutrients contents % in Saudi Sukkari and Egyptian Swei Dates fruit

Sample Nutrient	Saudi Sukkari Dates (%)	Egyptian Swei Dates (%)
Moisture	10.58	8,81*
Total Sugars	77.15	81.49*
Reducing Sugars	17.75	15.48*
Non-reducing Sugars	59.40	66.01*
Protein	2.39	1.97*
Fiber	4.23	2.77*
Fat	3.15	2.95*
Ash	2.50	2.02
T.S.S	89.42	91.20

* Significant at $p<0.05$

In regards of fat, Sukkari samples contained the high level then the Swei dates (3.156%) and (2.95%) respectively. The low fat level agreed with **Myhara et al., 1999** and **Saleh et al., 2011** who reported low level of crude fat in dates. Flesh of Egyptian date palm fruit had low fat level (2.90%) and safe to be consumed by heart and blood patients, because of the low level of saturated fatty acid and cholesterol free. Ash had relatively close percentages in Sukkari and Swei samples (2.50%) and (2.02%) respectively. Also, both Sukkari and Swei samples had close values of T.S.S (89.42%) and (91.20%) respectively. Ash is considered to be the nutritional quality indicator the obtained ash results were agreed with **Saad et al., 1986** who reported that ash content in dates was around 1.88-2.96%, but disagreed with **Ogungbenle, 2011** who recorded that value was 3.27%. Also, it agreed to allowance level of ash in

legumes 2.4-5.0%, so both samples had high quantities of essential mineral elements (**FAO, 1989**).

In general, dates are rich source of some important nutrients (protein, fiber, T.S.S and carbohydrates) but the difference in these levels were resulting from date palm varieties, environment and farming technique (**Soliman, 2002, Jamil et al., (2010**) and **Osman, 2008**).

Table (2) illustrates the comparison of mineral elements percentages between Saudi and Egyptian dates samples.The values of Cu, Na, Ca, Mg, K and P in Swei Egyptian sample were higher than the values of Sukkari Saudi sample. This result agreed with **Chaira et al., (2007); Nehdi et al., (2010) and Sadiq et al., (2013)**. The contents of Cu, Na, Ca, Mg and K were higher in Swei Egyptian sample (94.9, 81.7, 79.62, 66.33 & 55.11mg/100g) then Sukkari Saudi sample (81, 74.6, 75.33, 61.15 & 54.18mg/100g), respectively. Mn in Egyptian sample was 54.4 mg/100g while in Saudi dates was 55.3 mg/100g. The lowest minerals contents were Zn (0.80mg/100g) and Fe (4.35mg/100g) in Saudi sample, comparing to Egyptian dates (0.86mg/100g) and (4.56mg/100g), respectively.

The lowering of K in Saudi dates sample indicated the need of K-rich chemical fertilizers to make up the loose of K by plants and to keep the soil fertility **(Bacha and Abo-Hassan, 1981and Ogungbenle, 2011)**. Presence of Mg in dates is important for health as it plays a major role in relaxing muscle along the airway to lungs thus, allowing asthma patients to breathe easier. Also, it had important role in most reactions involving phosphate transfer. Mg is beneficial to people taking diuretics to control hypertension and suffer from excessive excretion of K through the body fluid **(Arinanthan et al, 2003)**. **Awan and Sohail, (1999)** showed higher the value in Ca and Fe as the values were 39 mg/100g and1.0 mg/100g, respectively. **He, (1998)** discussed the high values of mineral elements in palm dates and their important to human body, since the presence of Zn, Fe and Cu in many enzymatic compounds plays important role in support of metabolic function to strength the immunity and control diseases. Fe is said to be important element in the diet of pregnant women, nursing mothers, infants, convulsing patients and elderly to prevent anemia and other related diseases **(Oluyemi et al, 2006)**. Cu deficiency causes cardiovascular disorders, anemia, bone disorder and nervous systems **(Mielcarz et al, 1997).** Ca helps in regulating muscle contraction and is required for bones and teeth development **(Margaret and vickery, 1997)**. Zn is considered to be essential trace element for protein and nucleic acid synthesis and normal body development during rapid growth periods such as infancy and recovery of illness **(Melaku, 2005)**. Some studies referred the differences among mineral element of different varieties are due to differ in soil, location, rain rate and irrigation **(Kawashim and Seares, 2003)**.

Table (3) is the comparison of vitamins contents in both Sukkari and Swei dates. The highest vitamins was Nicotinic acid, B2, B6 and B1 in Egyptian sample (173.64, 105.18, 59.71 and 42.74 ppm), then the Saudi sample (109.91, 92.21, 22.34 and 27.95ppm), respectively. B12 was higher in Saudi sample (33.89 ppm) comparing to Egyptian one (23.32 ppm). Vitamin C had same level in both samples (10.52 mg/100g). The lower content of B9 was Sukkari sample (5.07 ppm) followed by Egyptian sample (11.57 ppm).

According to our results, Date fruits are rich of vitamins, which agreed to some studies indicated dates were rich source of vitamin C that prevents oxidation, also rich source of B1, B2, B6 and Nicotinic acid that have variety of functions that help maintain blood, metabolize carbohydrates and maintain blood glucose levels, fatty acid for energy and help to make hemoglobin, red and white blood cells. The levels of these vitamins differ according to the source, planting techniques, processing methods and food age **(Duke, 1981; Dangoggo et al, 2012 and Anjum et al, 2012)**.

Table (2) Comparison of mineral elements in Saudi & Egyptian Dates fruit

Sample Element	Saudi Sukkari Dates(mg/100g)	Egyptian Swei Dates(mg/100g)
Ca	75.33	79.62*
Fe	4.35	4.56
Zn	0.80	0.86
K	54.18	55.11*
Na	74,6	81,7*
Mg	61.15	66.33*
P	49.96	53.87*
Mn	55.3	54.4*
Cu	81	94.9*

* Significant at $p<0.05$

Table (3) Comparison of vitamins in Saudi & Egyptian Dates fruit

Sample Vitamin	Saudi Sukkari Dates ppm	Egyptian Swei Dates ppm
C (mg/100g)	10.52	10.52
B1	27.95	42.74*
B2	92.21	105.18*
B6	22.34	59.71*
B9	5.07	11.57*
B12	33.89	23.32*
Nicotinic acid	109.91	173.64*

Figure (1) Comparison of Acidity and pH in Saudi & Egyptian Dates fruit

Sample Vitamin	Saudi Sukkari Dates	Egyptian Swei Dates
Acidity	0.14	0.48*
pH	7.11	5.26*

Conclusion

This study results show that Saudi and Egyptian palm dates fruits have high nutritious and functional values in regards of their contents of moisture, total sugars, protein, fiber, fat, ash, T.S.S, Ca, Fe, Zn, K, Na, Mg, P, Mn, Cu, Vitamin C, B1, B2, B6, B9, B12 and nicotinic acid. These contents consumption reflects on the health benefits. Also, the results illustrate the acidity low level and pH high level in Saudi Sukkari dates comparing to the Egyptian Swei dates. The difference among these two samples is due to many reasons including sample source, climate, planting techniques, age and other factors.

References

1. Akasha, I., L.Campbell, and S. Euston, 2012. Extraction and characterizations of protein fraction from date palm fruit seeds. World Academy of Science, Engineering and Technology, 70: 292-294.
2. AOAC (Association of Official Agricultural Chemists).(2007). Official Methods of Analysis 18 ed. Published by A.O.A.C. Washington, D.C. (U.S.A.)
3. AlBakker, A., 2002. Palm dates, past and present, and new cultivation, manufacture, trade. Beirut, Arab House of encyclopedias. ed.2 p 1083.
4. Al-Farsi, M., C. Alasalvar, A. Morris, M. Baron and F.Shahidi, 2005. Comparison of antioxidant activity, anthocyanins, carotenoids and phenolics of three native fresh and sun dried date (*Phoenix dactylifers* L) varieties grown in Oman. Journal of Agriculture and Food Chemistry, 53, (11): 7592-7599.
5. Alkaabi, J., B. Al-Dabbagh, S. F. Ahmad, H. Saadi, S. Gariballa, and M. Al Ghazali, 2011. Glycemic indices of five varieties of dates in healthy and diabetic subjects. Nutrition Journal, 10:59. doi:10.1186/1475-2891-10-59.
6. Al-Qarawi, A.A., H.M. Mousa, B.E. Ali, H. Abdel-Rahman and S.A. El-Mougy, 2004. Protective effect of extracts from dates (Phoenix dactylifera L.) on carbon tetrachloride induced hepatotoxicity in rats. Inter. J. Appl. Res. Med., 2, 176-180.
7. Al-Sawaf, D., 2011. Qualitative and Quantitive Analysis of Amino Acids Isolated from Protein of Phoenix dactylifera and Determination of Molecular Weight by Gel Filtration (part I). Al-Rafedain Sciences J., 22 (2): 111-128
8. Al-Shahib, W. and Marshall, R.,2003. The fruit of the date palm: its possible use as the best food for the future. International Journal of Food Sciences and Nutrition,54, (4): 247-259
9. Al-Shahib, W. and R. Marshall, 2002. Dietary fiber content of 13 varieties of date palm (Phoenix dactylifera L.). J. Food Sci. Technol., 37, 719-721.
10. Anjum, F., S.Bukhat, A. El-Ghorab, M. Khan, M.Nadeem, S.Hussain, and M.Arshad, 2012. Phytochemical characteristics of Date Palm (Phoenix dactylifera) fruit extracts. Pak. J. Food Sci., 22 (3): 117-127.
11. Arinanthan,V., V. R. Mohan and A. J. Britto, 2003. Chemical Composition of Certain Tribal Pulses in South India. International Journal of Food Sciences and Nutrition, 3: 103-107.
12. Awan, J.A. and F. Sohail, 1999. Dates and Date Products. Unites communications, 498-B, Peoples Colony, Faisalabad. Pakistan.
13. Bacha, M. and A. Abo-Hassan, 1981. Effects of soil fertilization on yield, fruit quality and mineral content of Khudari date palm variety. First Symposium on date palm. King Saud University, Riyadh
14. Bacha, M., T.Nasr, and M. Shaheen, 1987. Changes in Physical and Chemical Characteristics of the Fruits of Four Date Palm Cultivars. Proc. Saudi BioI. Soc., 10. pp. 285-295
15. Bamigboye, A. A.Okafor, and O. Adepoju, 2010. Proximate and mineral composition of whole and dehulled Nigerian sesame seed. Afr. J. Food Sci.Technol., 1:76-81.
16. Bauza, E., 2002. Date palm kernel extract exhibits antiaging properities and significantly reduces skin wrinkles. Intr. J. Tissue Reac., 24: 131-136
17. Chaira, N., A. Ferchichi, A. Mrabet, and M. Sghairoun, 2007. Chemical composition of the flesh and pit of date palm fruit and radical scavenging activity of their extracts. Pakistan Journal of Biological Sciencesn, 10 (13): 2202-2207

18. Dangoggo, M., M. Bunu, A.Uba, and Y. Saidu, 2012. Study of Proximate, mineral and anti-nutrient composition of Punica granatum seeds from North-Western Nigeria, and Saudi Arabia. Marsland Press, Researcher ,4(4):4-9.
19. Duke, J., 1981. Hand book of Legumes of world Economic importance. Plenum press, New York, pp 33.
20. El-Sohaimy, S. and E. Hafez, 2010. Biochemical and maturational characterizations of date palm fruits (Phoenix dactylifera L.). Journal of applied sciences research, 6,(8):1060-1067.
21. FAO. 1989. Utility of Tropical foods: Tropical beans. Food and Agricultural organization publication pp 22-26.
22. Farkye, N., K. Smith, and T.Schonrock, 2001. An overview of changes in the characteristics, functionality and nutritional value of skim milk powder (SMP) during storage. USA. U.S. Dairy Export Council
23. Gad, A. A. Kholif, and A. Sayed, 2010. Evaluation of the nutritional value functional yogurt resulting from combination of date palm syrup and skim milk. American Journal of Food technology, 5 (4): 250-259.
24. He, Z., 1998. Human nutriology. People's Hygiene Press, Beijing, 87-96.
25. Jamil, M., R.Nadeem, M.Hanif, M.Ali, and K. Akhtar, 2010. Proximate composition and mineral profile of eight different unstudied date (Phoenix dactylifera L.) varieties from Pakistan. African Journal of Biotechnology,9(22): 3252-3259.
26. Kawashima, L. and L. Soares, 2003. Mineral profile of raw and cooked leafy vegetables consumed in southern Brazil. J. food Comp. Ana., 16: 605-611.
27. Margaret, L. and B.Vickery, 1997. Plant Products of Tropical Africa. Macmillan in College ed. London.
28. Melaku, U., E. W. Clive, and F. Habtamon, 2005. Content of zinc, Iron, Calcium and Their Absorption Inhibitors in Ethiopia. Journal of Food Composition Analysis, 18: 803-817.
29. Mielcarz, G., A. Howard, N. Williams, G. Kinsman, Y. Moriguchi, S. Mizushima, and Y. Yamori, 1997. Copper and Zinc Status as a Risk Factor for Ischemic Heart Diseases. A Comparison between Japanese in Brazil and Okinawa. J. Trace Element Exp. Med., 10: 29-35.
30. Myhara, R., J.Karkalas, and M.Taylor, 1999. The composition of maturing Omani dates. Journal of the Science of Food & Agriculture, 79, (11): 1345-1350.
31. Nehdi, I., S. Omri, M. Khalil, and S. Al-Resayes, 2010. Characteristics and chemical composition of date palm (Phoenix canariensis) seeds and seed oil. Industrial Crops and Products, (32) 360–365.
32. Ogungbenle H. N. ,2011. Chemical and Fatty Acid Compositions of Date Palm Fruit (Phoenix dactylifera L) Flour. Bangladesh J. Sci. Ind. Res., 46(2): 255-258.
33. Oshodi A. A., H. N. Ogungbenle and M. O. Oladimeji ,1999. Chemical composition, nutritionally valuable minerals and functional properties of benniseed, pearl millet and quinoa flour. Int. J. Food. Sci. Nutr., 50: 325-331.
34. Osman, M., 2008. Fruit Quality and General Evaluation of Zaghloul and Samany Date Palms Cultivars Grown under Conditions of Aswan. American-Eurasian J. Agric. & Environ. Sci., 4 (2): 230-236.
35. Parkin, D., F.Bray, J. Ferlay, and P.Pisani, 2005. Global Cancer statistics 2002. CA Cancer J Clin., 55: 74-108.
36. Oluyemi, E., A.Akilua, A. Adenuya, and M. Adebayo, 2006. Mineral Contents of Some Commonly Consumed Nigerian Foods. Science Focus., 11(1):153-157.
37. Radaamidzic, J., C. Olivera and V. Sote, 2005. RP-HPLC Determination of vitamins B1, B3, B6, folic acid and B12 in multivitamin tablets. J. Serb. Chem. Soc., 70(10):1229-1235.
38. Saad, F., M.Shaheen and M. Bacha, 1986. Chemical analysis of fruits of some saudi-grown date palm cultivars with emphasis on their mineral content. Proc. Saudi BioI. Soc., 9:25-33.
39. Sadiq, I. T. Izuagie, M. Shuaibu, A. Dogoyaro, A. Garba, and S. Abubakar, 2013. The Nutritional Evaluation and Medicinal Value of Date Palm (Phoenix dactylifera). International Journal of Modern Chemistry 4(3): 147-154.
40. Saleh, E., M. Tawfik, and H. Abu-Tarboush, 2011. Phenolic Contents and Antioxidant Activity of Various Date Palm (Phoenix dactylifera L.) Fruits from Saudi Arabia. Food and Nutrition Sciences, 2: 1134-1141.
41. SAS Institute Inc. ,1998. Statistical Analysis System User's Guide (Vol. I and II. Version 6) Cary, NC: SAS Institute.
42. Soliman, S., 2002. Studies on the evaluation of fruit characteristics of Samany date palm grown in Aswan. J. Agric. Sci. Mansoura Univ., 27(8): 5421-5428.
43. Somogyi, M., 1952. Notes on sugar determination. Bioi. Chem., 195: 19-23.
44. Vyawahare, N., R. Pujari, A. Khsirsagar, D. Ingawale, M. Patil, V. Kagathara, 2009. Phoenix dactyllifera: An update of its indegenous uses photochemistry and pharmacology. Int. J. Pharma.7(1), 1531-2976.

4/26/2014