J. Food and Dairy Sci., Mansoura Univ., Vol. 2 (11): 605 - 615, 2011

PHYSICAL AND CHEMICAL CHANGES IN FRUITS OF THREE DATES PALM (*Phoenix dactylifera L.)* GROWN IN SOUTH VALLEY, EGYPT

Ragab, W. S.*; B. R. Ramadan*; M. A. Sorour and Naglaa A. Ahmed*****

***Food Sci. & Tech. Dept., Fac. of Agric., Assiut University, Egypt.**

****Food Sci. Dept., Fac. of Agric. Sohag University, Egypt**

*****Food Sci. & Dairy Dept., Fac. of Agric. South Valley Univ., Egypt**

ABSTRACT

The physical and chemical changes in fruits of Siwi, Hagazy and Unknown1 dates palm were studied during three development stages (Khalal, Semi Rutab and Rutab). Results showed that such characteristics varied greatly during riping stages with some variations between the studied dates samples. Fruit weight, flesh weight and pit weight were decreased from Khalal to Semi-Rutab and Rutab stages. Moisture, ash, protein, fats, non-reducing sugars and fibers contents decreased especially in the Rutab stage. Total and reducing sugars progressively increased from Khalal to Semi-Rutab and Rutab stages. Data revealed that the percentage of potassium, phosphorus, sodium, magnesium, and cupper decreased from Khalal to Semi-Rutab and Rutab stages except iron increased.

INTRODUCTION

Date palm (*Phoenix dactylifera L*.), is one of the oldest fruit crop mainly cultivated in North Africa and Middle East countries it constitutes the most important plant in arid and desert area (Zaid, 1999 and Al-Shahib and Marshall, 2003). The role of date palm has been well established the birth of the human race. Muslims consider it as a virtue to eat dates especially during the holy month of fasting (Ramadan) at Iftar. Muslims believe that "He who eats seven dates every morning will not be affected by poison or magic on the day he eats them" (Miller *et al.* 2003).

Date palm is widely distributed in different districts of the world. There are over 3000 varieties of dates grown world-wide. Worldwide dates productions is about 7527.6 thousand tons in 2009.Dates are important trade-tional crops. According to FAO (2009), Egypt is considered as the first country of the top ten date producers (1,130,000 tones) (Sidhu, 2006 and FAO, 2009)

In Egypt, date palms are distributed in Nile valley, oases and desert. Include soft dates (Zagloul,Samani, Hayani, Bent- Aicha, Amhat , …etc) semi –dry dates (Al-Amri, Saidy, Al-Aglani, …etc) and dry dates (Barakawi, Ebrimi, Sakouti,…etc). Besides, there is a great number of seedling date palms (Manthour), as a result of sexual reproduction, some of them are highly desirable for fruit qualities and propagation of there off-shoots as well (Youssef and Ramadan,1987 and Mohammed 2000).

The date palm, which is considered as one of the most friendly tree species to human kind, It is known as “tree of life” because of its resilience,

its need for limited water in puts, its long term productivity and its multiple purpose qualities. Fruits of the date palm (*Phoenix dactylifera L.*) are very commonly consumed in many parts of the world and a vital component of the diet and a staple food in most of the Arabian countries. especially in the arid regions where due to the extreme conditions, very few plants can grow. Date fruits are a good source of low cost food and are an integral part of Arabian diet. For Muslims all over the world dates are of religious importance and are mentioned in many places in the Quran (Ramdan,1995 ; Al- shahib & Marshall, 2003 and Al-farsi & lee, 2008).

Dates are rich in certain nutrients and provide a good source of rapid energy due to their high carbohydrate content (70–80%). Because of this the fruits are a high source of energy and it is approximated that 100 g of the flesh can provide 314 K. cal of energy. Most of the carbohydrates in dates are in the reducing sugars form of (fructose and glucose) which are easily absorbed by the human body (Al-Hooti et al.,1995; Myhara *et al.,*1998; Al-farsi *et al.,*2005; Al-farsi *et al* 2008 and Safi *et al* 2008). The present study aims to throw the physical and chemical changes in fruits of Siwi, Hagazy and Unkown1 dates palm grown in south valley, Egypt.

MATERIALS AND METHODS

Materials

This study was carried out on fruits of three different dates which lie in two groups; classified (Siwi and Hagazy) which are semi dry dates and unclassified (manthour or seedling) which named Unknowen1.(Khalal, Semi-Rutab and Rutab) the three stages of maturity .These dates obtained from Naghamadi,Qena governorate, Egypt during the 2007 season.

The different date samples were randomly collected from their sources and transferred to the laboratory for analaysis. Each of these fruit type was divided into two parts; the first part used for some physical evaluations such as fruits number K.g, the mean weight of whole date fruit, date flesh and pit per gram, flesh and pit percentage .The second part of samples was cleaned and separated pits using sharp knife edge. After cuted the flesh (pulp) in small pieces and minced just before analysis. Representative samples were taken immediately after mincing for determination of chemical composition.

Analytical methods:

The moisture content was measured by drying the sample in an air oven at 70◦c until it reached to a constant weight according to AOAC (1990b). Reducing sugars and total sugars were estimated by Lan and Eynon method according to (AOAC, 2000). Non reducing sugars calcuted by difference =Total sugars- Reducing

The nitrogen content was analyzed using the standard Kjeldahl procedure (AOAC, 2000). Protein content was determined by multiplying the nitrogen content by 6.25 food commodities nitrogen/protein factors according to Merrill and Watt (1973) , Mosse (1990), Chang (1998) and Besbes *et al*.

(2004).Crude fibers were determined according to AOAC (2000) as the residual of sequential extraction of defatted sample with 1.25 % H2SO4 and 1.25 % NaOH using DOSI Fiber (J. P .Select .S .A), the insoluble were collected by filtration, dried, weighed and ashed to correct for mineral contamination of fiber residue. Crude fat and ash content was determined as described by AOAC (1990a). The pH values were measured using digital pH meter model no. APX 175, Control Dynamics Ltd., Bangalore, India.The minerals content of date fruits flesh was assessed according to (AOAC, 1990b) Sodium determined using flame photometer (410), mangnesium, calcium, iron, mangenise, zanic and cupper were determinde using (Perkin Elmer Atomic Absorption Spectero – photometer 2380). Phosphorus contente was determinde by spectero photometer.

Statistical analysis:

Data were subjected to analysis of variance and the main standard deviation (MS±SD) at 5% probability according to Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

Physical characteristics:

The physical characteristics of the studied dates are represented in Table (1). The number of fruits /kg ranged from 30-85in Khalal stage. Data indicated that fruit number /kg increased in the Semi-Rutab and Rutab stage to ranged between 36-92 and 40-98 ,respectively principally for increased the number fruits/ kg in Khalal stage, semi Rutab and Rutab due to in Khalal stage the moisture content highest in fruits while in semi –Rutab the fruits had lost apart of moisture and in Rutab stage the moisture content had lowest. These results lower than those reported by Gado (1999) the fruits number /kg ranged between(40-72).The mean weight of date fruit ranged from 11.76-33.33g in Khalal stage, however it was decreased to varied from 10.20-24.90g in Rutab stage. These results higher than those reported by Yousief and Abou –Ali (1993) the average of weight of 8 varieties grown in Al-Hassa at Rutab stage between (9.50-18.50g).

Also, result in Table (1) show that the mean weights of the flesh and pit were gradually decreased during ripening from Khalal to Rutab stage in all studied date fruits. These results higher than those reported by Mohammed *et al. (*1983) found the fruit pulp and pit of fifty Iraq date cultivars at Khalal stage was (3.87-16.80g) and (0.84-1.80g).respectively. These results accordance with data reported by Minessy *et al*. (1975) found the flesh weight of four soft date cultivars was increased gradually till the fully colored but it was decreased at Rutab stage. While the mean weight of pit decreased to varied from (1.30-3.20g) for Hagazy and Siwi date cultivars, respectively. The flesh percentage in Rutab stage varied from (80.85-95.18%) and pit percentage ranged between (4.82-19.15). Those results higher than those reported by Gado (1999) the flesh percentage for Samany, Hayany and Amhat date varieties ranged between (84-90%) and pit percentage varied

from (10-16%). Data (Table 1) observed that the pH value was increased to varied from 6.51-6.90% and from 6.90-7.34% in Semi-Rutab and Rutab stage, respectively.

Table (1):Effect of development stages on physical characteristics of some dates fruits (Means ±SD)

Date samples	Fruit development stage	Fruits No/kg	Fruit weight	Flesh weight	Pit weight (g)	Flesh%	Pit%	pH
Siwi	Khalal	30±0.35	33.33±0.39	29.83±0.12	3.50±0.27	89.49±0.67	10.51±0.67	6.75±0.01
	Semi-Rutab	36±0.37	27.77±0.29	24.56±0.26	3.20±0.04	88.47±0.03	11.53±0.03	6.69±0.53
	Rutab	40±0.34	24.90±0.21	22.00±0.18	2.90±0.03	88.35±0.02	11.65±0.02	7.34±0.46
Hagazy	Khalal	32.±0.27	31.28±0.27	29.26±0.22	2.00±0.02	93.53±0.12	6.47±0.12	6.60±0.02
	Semi-Rutab	38±0.31	26.31±0.22	25.01±0.20	1.30±0.02	95.05±0.03	4.95±0.03	6.90±0.02
	Rutab	43±0.35	23.25±0.19	22.20±0.17	1.05±0.02	95.18±0.23	4.82±0.23	7.01±0.04
Unknown 1	Khalal	85.±0.82	11.76±0.11	9.67±0.19	2.10±0.10	82.16±0.96	17.84±0.96	6.30±0.03
	Semi-Rutab	92±0.50	10.87±0.06	8.87±0.10	1.99±0.05	81.65±0.51	18.35±0.51	6.51±0.04
	Rutab	98±0.77	10.20±0.08	8.25±0.07	1.95±0.14	80.85±1.27	19.15±1.27	6.90±0.03

Gross Chemical Composition

Moisture content:

Result in table (2) show that the moisture content of the studied date fruits was highest in the Khalal stage and then rapidly decreased in the Semi-Rutab and Rutab stages. Table.2 this result holds true in the different date fruits. At Khalal stage Hagazy fruits had the highest moisture content (58.84%) followed by Siwi (53.95%) and Unknowen1 (50.75%).While, Hagazy fruits recorded the lowest moisture content (21.73%) at Rutab stage. these results are in rather close agreement or even less than that reported by Bacha *et al* (1987); Al-Shahib and Marshall (2002) and Ahmed et. al. (1995) found the averages moisture content in Khalal stage about 65.9%.

Sugars content:

The results indicated that the reducing sugars increased progressively towards the Rutab stage. And this increase was more obvious in this stage in the three date fruits (Table 2). This percentage increased from 62.72%, 60.46% and 56.53% at Khalal stage to 77.80, 72.41 and 62.84% at Rutab stage for Siwi, Hagazy and Unknowen1fruits, respectively. The non-reducing sugars were much lower in the fruits and were found not to exceed 14.47% in any of the dates fruits used. The percentage of total sugars increased from 71.26% in to 84.03 % in Siwi, from 74.93% to 81.46% in Hagazy, and from 64.78% to 68.01% in Unknowen1 fruits at Khalal and Rutab stage, respectively. The results of reducing and non –reducing sugars of the date fruit higher than those mentioned by Khalifa (1973) and Bacha *et al*., (1987). Reducing sugars and non reducing sugar in selleg; Sakhi and khudari ranged between (13.04-16.06%) and (1.97-4.95%), respectively. Bacha et al. (1987) reported that reducing sugars and non –reducing in Sillaj; Sakhi; Khudari and Sifri varied from (14.31-16.39%) and (2.32-4.30%), respectively.

2

But lower than those reported by Sawaya *et al.* (1983) while the results of total sugars of date samples higher than those reported by Bacha *et al*., (1987); Fayadha and Al-Showiman (1990) and Ahmed and Robinson (1999) but lower than those mentioned by Sawaya *et al*., (1983) and Al-Shahib and Marshall (2003).

Fat content:

Data in Table (2) showed that the fat content decreased progressively towards the Rutab stage in the studied date fruits it was ranged from 1.46% to 2.36% in Unknown 1 fruits at Khalal stage. While fruits of Unknowen1 and Siwi contained the lowest fat content at Rutab stage 1.06%. These results are lowest than those reported by Saleh *et al* (1987). They are also higher than those reported by Khatchadourian *et al*.(1982). Crude fat content decreased these in the same line with obtained by Al- Hotti *et al*.(1995) the crude fat content consistently was decreased or remained unchanged as the fruit pass through the different stages of maturity from Kimri to Tamer stages .and Sawaya *et al*. (1983) the crud fat of fifty-five variance of dates in Saudi Arabia was decreased as the fruit passed from Khalal to Tamer stages through the fruit maturity stages.

Protein content:

Data showed that protein content of the fruits was high in the Khalal stage In the three studied dates, then it was greatly decreased. In the (Table2). Unknown 1fruit recorded the highest protein content in Khalal (3.55%) and Rutab stage (1.99%). These results higher than those reported by Bacha *et al*. (1987) found the protein content of four dates varieties ranged between (2.90-3.40%) and Al-Shahib and Marshall (2003). but was lower than those reported by Sawaya *et al*. (1983) and Sawaya *et al*. (1983) the protein content of fifty- five varieties of dates in Saudi Arabia at Khalal stage were ranged from (2.10-4.40%).

Fiber content :

Data in Table (2) also recorded that Hagazy date fruits had the highest fiber content compared with the other date fruits. Fiber content was decreased from 8.64% to 4.24% in Hagazy and from 3.81% to 3.44% in Siwi at Khalal and Rutab stage, respectively. These results higher than those obtained by Meligi *et al*. (1983) and Salem and Hagazi (1991) the fiber content for five dates varieties ranged between (1.98-3.50%).

Ash content:

Ash fruit content was continually decreasing in the three stages of development in the three dates. Its decrease in the Semi-Rutab stage was more profound than in the Rutab stage (Table 2). Siwi fruits contained the highest values of ash (2.96%) in Khalal stage, While Hagazy fruits contained the highest ash content in the Semi-Rutab(2.56%) and Rutab stage (2.18%). These results higher than those obtained by Yousif et al (1982) and Al-Hooti et al. (1995) the ash content for six dates varieties ranged between (2.2-3.8%).

Mineral content:

Data in table (3) showed that the average values of the macro-elements; K ,Na, Mg and P and micro-elements ; Fe and Cu of the studied date fruits at

the different ripening stag data revealed that potassium was the predominate element present in all date fruits under investigation. Siwi date contained the highest level of potassium in Khalal (928.7mg/100g) followed by Hagazy fruits (799.1 mg/100g), while potassium Unknown 1 fruits recorded the least level as average (644.6 mg/100g). These results lower than those obtained by *Sawaya et al*.(1983) content of fifty-five date varieties in Khalal stage ranged between (701- 1868 mg /100g),but higher than that obtained by Al-Hooti *et al*.,(1995) (510.1 mg / 100mg). At Khalal stage.

(Table.3): Effect of fruit development stag on mineral content of some dates palm fruit (mg 100g on dry weight basis)

samples	Fruit development stage	K	Na	Mg	P	Fe	Cu
Siwi	Khalal	928.70	84.20	5.15	154.49	1.97	0.69
	Semi-Rutab	746.40	64.30	4.21	130.30	3.57	0.40
	Rutab	582.10	32.90	4.21	128.34	4.00	0.30
Hagazy	Khalal	799.10	73.90	5.46	127.96	1.65	0.55
	Semi-Rutab	782.20	63.10	4.11	118.43	2.34	0.51
	Rutab	541.70	10.36	3.59	97.07	3.46	0.30
Unknowen1	Khalal	644.60	90.70	5.42	130.51	2.29	1.38
	Semi-Rutab	642.70	69.60	5.23	117.15	2.71	1.36
	Rutab	633.80	39.70	4.67	114.26	3.83	0.49

The potassium content mg /100g dry weight basis were varied from 642.70 to 782.2 and from 541.7 to 633.8 of date fruits at Semi-Rutab and Rutab stage, respectively. From the data in (Table,3) it was marked that sodium content in date fruit at Khalal stage , Semi-Rutab and Rutab varied from 73.9 to 90.7 mg, 63.1 to 69.6 mg and 10.36 to 39.7 mg , respectively. Unknown 1 date fruits recorded the highest amount of sodium content 90.7, 69.6 and 39.7 mg in Khalal, Semi –Rutab and Rutab stage, respectively. While Hagazy recorded the lowest level of sodium (10.36 mg / 100g) in Rutab stage. The data observed that the sodium content decreased during maturity Khalal, Semi- Rutab and Rutab. These results are in the same line with those reported by Sawaya et. al. (1983), Ramadan (1990) and Al-Hooti *et al*.(1995).

Data in table (3) indicated that, the fruits of Siwi contained the highest amount of phosphorus (154.49 mg / 100g) followed by Unknown 1 (130.51 mg /100g) and Hagazy dates varieties (127.96 mg / 100g) at Khalal stage. The studied date fruits contained higher concentration of phosphorus than those reported by Sawaya *et al* .,(1983b) the phosphorus content in fifty-five date varieties in Khalal stage ranged between (37-143mg / 100g) on dry weight basis.

The phosphorus content of studied date samples was gradually decreased during fruits ripening from Khalal to Rutab stage, respectively. Hagazy fruits at Rutab stage had the lowest Mg level (3.59mg / 100g) these results are in the same line with those published by Sawaya *et al*. (1983b) and AL-Hooti *et al*. (1995).

The results presented in Table (3) revealed that the studied date fruits in Khalal stage contained magnesium higher than those recorded in the same fruit in Semi-Rutab and Rutab stage. Observed that the magnesium content decreased in Semi-Rutab and Rutab stage to varied from 5.15 to 4.21 mg / 100g, 4.11 to 5.23 mg /100g and 3.59 to 4.67mg /100g in Khalal, Semi-Rutab and Rutab stage, respectively. These results in the same line with those published by Sawaya *et al*. (1983); Sawaya *et al.* (1983b) and Al-Hooti *et al.*(1995).

Siwi date varity contained the highest level of iron 4.0 mg /100g of at Khalal stage. While the lowest iron amount was recorded for Hagazy fruits (1.65 mg / 100g) in Khalal stage. The results are in line with those reported by the difference in the Fe content of date fruits may be due to genetic differences (Shinwari 1987). Data in Table (3) observed that the Fe content increased to varied from 2.34-3.57 mg / 100g from 3.46- 4.0 mg /100g of Semi-Rutab and Rutab stage, respectively. These results higher than those reported by Al-Hooti *et al*. (1995).

The concentration of copper of date studied varied from 0.30-1.38 mg / 100g. The highest Cu level recorded of Unknown 1 1.38 mg /100g followed by Siwi 0.69 mg /100g and Hagazy 0.55mg / 100g at Khalal stage. These results are in the same trend with those recorded by Sawaya *et al*. (1983).

The copper content of date fruits under this study was decreased during ripening to varied from 0.40-1.36 mg / 100g from 0.30- 0.49 mg / 100g sample at Semi-Rutab and Rutab stage, respectively. These results lower than those recorded by Al-Hooti *et al.* (1995). These data are in the same line with those reported by Ramadan (1990) found the mineral contents of Saidy date decreased during maturity till it reached to tamer stage Al-Hooti *et al*. (1995) pointed out that the mineral content of five varieties of dates depends on the ripening stage. The percentage of calcium, magnesium, phosphorus, potassium, sodium and zinc in all five cultivars.

REFERENCES

Ahmed, A. and Robinson, R. K. (1999): The ability of date extract to support the production of a flatoxins. J. of Food Chemistry, 66 (3): 307-312.

Ahmed, I. A.; Ahmed, A. K. and Robinson, Richard K. (1995): Chemical composition of date varieties as influenced by the stage of ripening. J. of Food Chemistry.,54(3): 305-309.

Al Farsi, M.; Alasalvar, C.; Morris, A.; Baron, M. and Shahidi, F. (2005): Compositional and sensory characteristics of three native sun-dried date (Phoenix dactylifera L.) varieties.

Al Farsi, M. A. and Lee, C. Y. (2008): Nutritional and functional properties of dates: a review. Critical Reviews in Food Science and Nutrition., (48): 877−887.

Al-Hooti, S. N.; Sidhu, J. S. and Qabazard, H. (1995): Studies on the physico-chemical characteristics of date fruits of five UAE cultivars at different stages of maturity. Plant Foods for Human Nutrition. Arab Gulf J.of Scientific Research. 13(3): 553-569.

Al-Shahib, W. and Marshall, R.J. (2002):Dietary fiber content of dates from 13 varieties of date palm (*Phoenix dactylifera L.*). Int. J. Food Sci. Tech., (37):719–721.

Al-shahib, W. and Marshall, R. J.(2003): The fruit of the date palm: its possible use as the best food for the future?. Int. J. of Food Sci. and Nutrition.,54(4): 247 – 259.

AOAC (1990a): official methods of analysis of the Association of official Analytical Chemists (15th Ed) edited by K .Helrich Washington DC: AOAC.

AOAC (1990b): Association of Official Analytical Chemists. Official methods of analysis. Arlington, USA: Association of Official Analytical Chemists.

AOAC (2000): official methods of analysis (17th Ed.). Associate of official Analytical Chemist Washington., DC.

Bacha , M. A.; Nasr, T. A and Shaheen , M.A. (1987):Changes in Physical and Chemical Characteristics of the Fruits of Four Date Palm cultivars proc. Saudi Biol. Soc., (10) : 285-295.

Besbes, S.; Blecker, C.; Deroanne, C.; Drira, Nour-Eddine. And Attia, H. (2004): Date seeds: chemical composition and characteristic profiles of the lipid fraction. J. of Food Chemistry. 84(4): 577-584.

Chang, Sam K. C. (1998): Protein Analysis. In: Food Analysis, Editor S.

FAO (2009): Food and Agriculture Organization of the United Nations. Agro-Statistics Database.

Fayadha , J.M. and Al-Showiman (1990): Chemical composition of date palm (*phoenix dactylifera L*.) J. Chem. Soc. Pak., 12 (1): 84-103.

Gado, G. B. A. (1999): Chemical and technological studies on some local date varieties. MSc. Thesis, Fac. Of Agric, Food, Sci. and Tec. Minia .Univ. Egypt.

Kalifa , A. S. (1973): Physiological studies on maturity . Ripening, handling and storage of date. Ph.D. Thesis, Fac. Of Agric., Ain Shams Univ., Egypt

Khatchadourian, H.A.; Sawaya, W. N.; Khalil, J. K.; Safi, W.M. and Mashadi, A.A. (1982): Utilization of dates (*Phoenix dactylifera L*.) grown in the Kingdom of Saudi Arabia, in various date products. Proceedings of the First Symposium on the Date Palm, King Fiasal Univ., Al-Hassa, Saudi Arabia: 504.

Merrill, A.L. and Watt, B.K. (1973): Energy value of foods: basis and derivation. Agriculture Handbook No. 74. Washington, DC, ARS United States Department of Agriculture.

Meligi , M.A.; Sourial , S.F.; Mohsen , A.M.; Khalifa, A. and Abdalla, M.Y. (1983) : Fruit quality and general evaluation of some Iraqi date palm cultivars grown under condition of Barrage region , Egypt. The first Symp. On Date palm, King Fiasal Univ., Saudi Arabia., 2-12.

Miller, C.J.; Dunn, E.V.and Hashim, I.B.(2003) : The glycaemic index of dates and date/yoghurt mixed meals. Are dates 'the candy that grows on trees'? Eur J Clin Nutr., (57):427–30.

Minessy , F. A.; Bacha , M .A. and El-Azab , E.M. (1975): Changes in sugars and nutrient elements content in fruits of soft date varieties in Egypt . Alex. J. Agri. Res., 23 (2): 301-306.

Mohammed, A. Ali (2000): Palm culture and production of dates In Sudan. A country report, Palm and Dates Research Centre, Sudan.

Mohammed, S.; Shabana, H.R. and Mawlod, Elia. (1983): Evaluation and identification of Iraqi date cultivars Fruit characteristics of fifty cultivars. Date Palm J., 2(1): 27-55.

Mosse, J. (1990): Nitrogen to protein conversion factor for ten cereals and six legumes or oilseeds. A reappraisal of its definition and determination. Variation according to species and to seeds protein content. J. of Agricultural and Food Chemistry., 38(1): 18-24.

Myhara, R.M.; Taylor, M.S.; Slominski, B.A.and Al-Bulushi, I. (1998): Moisture sorption isotherms and composition of Omani dates.J. Food Engineering,(37):471–479.

Ramadan, B. R. (1990): Chemical and technological studies on some New Valley dates. M.Sc. Thesis, Food Sci. and Tech. Dept. Assiut Univ, Egypt.

Ramadan, B. R. (1995): Biotechnological, nutritional, and technological studies on dates. Ph.D. Thesis, Food Sci. and Tech. Dept. Assiut Univ, Egypt.

Safi, E.B.; Trigui, M.; Thabet, R.; Hammami, M.and Achour, L.(2008) : Common date palm in Tunisia: chemical composition of pulp and pits. Int. J. Food. Sci. Tech., (43):2033–2037.

Saleh, S .M., Yacolt, G .A .and El-Sadek, M .M. (1987): Biochemical changes in sound dry dates associated with mite infestation. Alx. J. Agric. Res., 32 (1): 477.

Salem, S .A. and Hagazi, S.M. (1991): chemical composition of Egyptian dry dates. J. Sci . Food Agric., (22): 632-633.

Sawaya, W. N.; Safi, W.M,; Khalil, J.K. and Mashadi, A.S. (1983): Physical measurements, proximate analysis, and nutrient elements content of twenty five date cultivars grown in Saudi Arabia at the Khalal (mature colour) and Tamer (ripe) stages. Proceedings of the 1st symposium on date palm, Saudi Arabia., 454-466.

Sawaya, W. N.; Miski , A. M.; Kalil , J .K .; Khachadourian , H.A. and Mashadi,A.S. (1983 b) : physical and chemical characterization of major date varieties grown in Saudi Arabia 1- Morphological measurements , proximate and mineral analysis. Date palm J., 2 (1):1-25.

Shinwari, M.A. (1987): Iron content of date fruits J. Coll. Sci., King Soud Univ. 18 (1): 5. (C.F. Chem. Abst., (107): 59-81.

Sidu, J. S. (2006): Date fruits production and processing. In: Handbook of Fruits and Fruit Processing, Edited by Hui, Y. H. (2006). Pp 391-419.Blackwell publishing, Oxford, UK.

Snedecor, G.W. and Cochran, W.G. (1980): "Statistical Method" 7th Fd., State Univ. Press Ames . Iowa. USA.

Yousif, A.K.; Benjamin, N.D.; Aldin, S.M. and Ali, S.M. (1982): Chemical composition of four Iraqi date cultivars. Date Palm J., (2):285-294.

Youssef, M .K.E. and Ramadan, B .R. (1987): Nutritive value of Dates Technical Bull. No.15, September, Fac. of Agric., Assiut, Egypt.

Yousief, A.K. and Abou – Ali, M. (1993): stability of fruit dates (rutab) for refrigeration and freezing storage. The third Symb. On date palm. Faisel univ.alhassa Saudi Arabia 290 – 298.

Zaid, A. (Ed.). (1999): Date palm cultivation. Rome: United Nations FAO Plant Production and Protection Paper.

التغيرات الطبيعية والكيميائية فى الثمار لثلاثة اصناف من نخيل البلح منزرعة فى منطقة جنوب الوادى بمصر

وفيق سند رجب* ، بلبل رمضان رمضان* ، محمد عبد الحميد سرور و نجلاء عبد الصبور احمد*****

***قسم علوم وتكنولوجيا الأغذية - كلية الزراعة - جامعة أسيوط**

****قسم علوم الأغذية - كلية الزراعة جامعة سوهاج**

***** قسم علوم الأغذية والألبان - كلية الزراعة - جامعة جنوب الوادى**

يهدف البحث إلي دراسة التغيرات الفيزيائية والكيميائية لثمار البلح السيوى والحجازي والمجهول (١), حيث تمت الدراسة خلال ثلاث مراحل نمو (الخلال والنصف رطب والرطب). بينت النتائج حدوث تغير شديد في خلال مراحل النضج مع بعض التفاوت بين الأصناف المدروسة, كما حدث إنخفاض في وزن الثمار الكاملة ووزن اللحم ووزن النوى من مرحلة الخلال إلى نصف الرطب ثم الرطب. كذلك إنخفض محتوى الرطوبة والبروتين والدهون والسكر الغير مختزل والألياف وخصوصاً في مرحلة الرطب, بينما إزداد محتوى السكر الكلى والسكر المختزل بإستمرار من مرحلة نصف الرطب إلى مرحلة الرطب. كما أوضحت النتائج أن النسبة المئوية للبوتاسيوم والفسفور والصوديوم والمغنسيوم والنحاس انخفضت من مرحلة الخلال إلى مرحلة نصف الرطب ثم إلى مرحلة الرطب, فيما عدا الحديد الذي ازداد محتوى الثمار منه.

قام بتحكيم البحث

أ.د / محمد طه شلبى — كلية الزراعة – جامعة المنصورة

أ.د / اشرف رفعت محمد الزينى — كلية التربيه النوعيه - جامعة المنصورة

Table (2): Effect of development stage on chemicals composition of date fruits on some dates palm (means±SD on dry weight basis, except moisture)

Date samples	Fruit development stage	Moisture %	Sugar			Crude Fat %	Crude Protein%	Fiber %	Ash %
			Reducing %	Non-Reducing %	Total %				
Siwi	Khalal	53.95±0.05	62.72±0.55	8.54±0.05	71.26±0.50	1.46±0.19	2.59±0.11	3.81±0.23	2.96±0.44
	Semi-Rutab	42.18±0.44	66.64±0.67	6.66±0.16	73.3±0.82	1.25±0.10	2.18±0.06	3.63±0.06	2.15±0.10
	Rutab	39.57±0.75	77.81±0.59	6.22±.25	84.03±0.93	1.06±0.05	1.96±0.03	3.44±0.08	2.14±0.06
Hagazy	Khalal	58.84±0.08	60.46±1.80	14.47±0.58	74.93±2.35	1.47±0.30	3.23±0.57	8.64±0.25	2.70±0.27
	Semi-Rutab	38.82±0.36	66.50±0.40	12.01±0.60	78.51±1.00	1.35±0.11	2.01±0.07	4.55±0.05	2.56±0.11
	Rutab	21.73±0.05	72.41±0.09	9.05±0.55	81.46±0.46	1.29±0.24	1.87±0.07	4.24±0.14	2.18±0.23
Unknowen1	Khalal	50.75±0.16	56.35±0.05	8.43±0.19	64.78±0.24	2.36±0.14	3.55±0.07	6.55±0.02	2.36±0.14
	Semi-Rutab	36.32±0.92	60.57±0.03	6.02±0.50	66.59±0.47	1.82±0.09	2.49±0.06	4.88±0.11	2.02±0.05
	Rutab	24.48±0.33	62.84±0.03	5.17±0.29	68.01±0.32	1.06±0.02	1.99±0.13	3.95±0.06	1.86±0.30