

PRODUCTION AND EVALUATION OF SOME PRODUCTS PREPARED FROM IMMATURE ZAGLOUL DATE (*Phoenix dactylifera*)

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ABSTRACT

Zagloul date palm (*Phoenix dactylifera*) is widely cultivated in Egypt. The immature dates (Kimri stage) with less commercial value were used for processing into date pickle, date jam and candied/ glazed/ chocolate coated dates. Chemical composition, and changes occurred during the pickling process were determined. pH, tannins and pectin were dropped gradually and a gradual increase in titratable acidity expressed as % lactic acid was noticed. The aforementioned products were found to be acceptable with respect to colour, taste, texture, odour and overall acceptability. These results showed that acceptable and nutritious zagloul date products can be prepared and marketed as specialty products.

Keywords: Date pickle Date jam, Candied date.

INTRODUCTION

Date (*Phoenix dactylifera*) is an important commercial crop in the Middle East and Arab countries especially Egypt. Date fruit is a rich source of carbohydrates comprising mainly of sugars and dietary fibre, making it one of the most nourishing natural foods available to the human. Dates are also a good source of vitamins and minerals such as P, Fe, K and a significant amount of Ca. (Kulkarni *et al.*, 2008 and Kulkarni *et al.*, 2010).

Dates are consumed fresh (Al-Hooti *et al.*, 1997-a); dried (Kulkarni *et al.*, 2008); and processed in the form of paste (Mustafa *et al.*, 1986); Jams (Mustafa *et al.*, 1983); juice concentrate (Kulkarni *et al.*, 2010); glaze (Sawaya *et al.*, 1986); drinks (El-Shaarawy *et al.*, 1986); syrup (dibis) (Abd El-Mohsen and Nezam El-Din., 1995); chutney and date relish (Al-Hooti *et al.*, 1997-b).

In addition, dates can be used in manufacturing several products such as liquid sugar, vinegar, alcohol, yeast, confectionery and pickles (Al-Ogaidi *et al.*, 1982; Khalchadourian *et al.*, 1983; Hamad *et al.*, 1983; Dowson and Aten, 1962; Hamad and Yousif., 1986; Hamad *et al.*, 1986; Moustafa *et al.*, 1986, El-Shimi and Hashimi, 1992 and Yousif and Al-Ghamdi, 1999).

The development of date fruits is divided into four stages named by their Arabic denomination, kimri, khalal, rutab and tamr. At the kimri stage, there is a rapid increase in size, weight and reducing sugars. It is the period of highest acid activity and moisture content (up to 85%). All factors level off at the end of this stage when the fruit starts to turn yellow or red according to variety. At this stage tannins will start to precipitate and lose their astringency which makes the date already palatable (Al-Hooti *et al.*, 1997b).

Zagloul date represents the major type of soft dates. This type of date grows well in El-Behera governorate (Edkou and Rosetta zones). The

period between maturing and ripening expands from May to October. The environmental, soil, and water conditions as well as exposure to insects and birds affect the load of the date palm tree. At the kimri stage zagloul palm trees lose at least 15 – 20% of its load underneath the trees.

Very little work has been done regarding the utilization of zagloul date underneath the trees during the kimri (green) stage. So, the objectives of the present work were to utilize this type of date to produce value added products such as date pickles, date jam, candied/ glazed/ chocolate coated dates.

MATERIALS AND METHODS

Materials:

Freshly immature zagloul dates were obtained from a farm in Edkou, Al-Behera governorate at the beginning of the third week of July, 2010. Zagloul date fruits underneath the trees were collected always between 6 to 7 in the morning and transported directly to the laboratory for the experimental studies. The date fruits were sorted, washed and used for the processing into pickles, Jam, candied and glazed dates.

Methods:

Physical Characteristics:

A random sample of 20 fruits of zagloul date were examined for fruit shape, colour, weight, length, width and percentage of flesh as well as calyx (cap) and pit (seed). Colour values of dates were measured by Lovibond schofield tintometer. Number/ kg and bulk density were also determined.

Technological methods:

Fig. (1) illustrates the flow sheets followed for preparing date pickles, date jam and candied/ glazed/ chocolate coated date products.

Chemical analysis:

Proximate analysis of zagloul date including moisture, crude protein ($N \times 6.25$), crude ether extract, total ash and crude fibre were carried out according to the AOAC (1990) procedures. Carbohydrates were calculated by difference. Minerals (Fe, Cu, Mg, Ca, Mn, Zn, Cd and Pd) were measured as described in the AOAC (1990) using perkin Elmer Atomic Absorption spectrophotometer (Model 2380). On the other hand, Na and K. were determined using flame photometer Model PEP7. Total soluble solids (TSS) at 20°C were determined by pocket refractometer (Model 2 WAJ; China). pH was measured by Cole Parmer pH meter. Titratable acidity as % lactic acid, pectin, tannins as % tannic acid by Folin Ciocaltu method after extracting with 70% ethanol were determined as described by Ranganna (1977). Total sugars (reducing and non-reducing) were determined using Lane and Enon procedure as stated in AOAC (1990).

Fig. (1) Flow sheets of Zagloul date products
1- Slow open kettle process 2- Quick process
(Minifie 1982)

Sensory evaluation:

Colour, taste odour, texture, appearance and overall acceptability of date pickle, date jam and candied/ glazed date were assessed using well trained panelists of Food Science and Technolog Dept., Alex. Univ., Egypt and hedonic scale rating test as described by Ranganna (1977), was used.

Statistical analysis:

Data were transformed using square root then analyzed using randomized complete block design (R.C.B.D.). Least significant differences at 0.05 probability level (L.S.D. 0.05) was used to compare between means of the studied treatments according to Steel and Torrie (1980).

RESULTS AND DISCUSSION

Physical properties of zugloul date:

General appearance of green zugloul date in the kimri stage is shown in Fig. (2). It can be noticed that zugloul date has oblong shape. The fruits were mildly sweet with a note of astringency. The physical characteristics of fresh immature zugloul date are presented in Table (1). The weight of single fruits ranged from 7.8 to 8.2 g. The length and width ranged from 3.59 – 3.61 cm and 1.92 – 1.96 cm, respectively. The number of fruits per kilogram was 127. The results obtained in the present study agreed well with those reported by Sawaya *et al* (1983)., (1986). The edible portion of zugloul date varied between 7.42 to 7.82g. On the other hand, the pit (seed) and calyx (cap) content varied from 0.34 to 0.42 g representing about 3.5% of the total weight of the fruit.

Chemical composition of zugloul date

The composition of the fresh immature zugloul dates is presented in Table (2).

Table (1): Physical characteristics of freshly immature zugloul date fruits

Character*	Value
Total weight (g)	7.9 ± 0.10
Length (cm)	3.5 ± 0.08
Width (cm)	1.94 ± 0.10
Number per Kg	127 ± 2.0
Bulk density (g/ cm ³)	0.65 ± 0.01
Lovibond reading	
Blue	6.0 ± 0.02
Yellow	6.5 ± 0.05
Red	2.7 ± 0.03
Weight of flesh (g)	7.62 ± 0.06
Weight of calyx and pit (g)	0.28 ± 0.03
% of flesh	96.46 ± 0.03
% of calyx and pit	3.54 ± 0.02

* Means ± S.D.



Fig. (2) General appearance of freshly immature zagloul date fruits

Data in Table (2) indicated that moisture was the major component of green zagloul date. Therefore, It was subjected for rapid deterioration if it was kept at room temperature, thus processing of immature zagloul date fruits might reduce their losses. Generally, green zagloul date contained relatively higher values of crude protein and crude fibre being 8.12 and 11.72%, respectively (on dry weight basis). Slightly lower values of crude ether extract and total ash were noticed. The results indicated that freshly immature zagloul date fruits are rich in carbohydrates. Total sugars (reducing) were 7.45%. No reducing sugars were detected in zagloul date at kimri stage. The results obtained here are in a good agreement with those reported by Ragab *et al.*, (1956) and Abdalla *et al* (2008). Results in Table (2) also showed that green zagloul date fruits had higher content of Na, K and Mg. Meanwhile, Ca, Zn, Fe, Cu and Mn were found in lower concentrations. These results agreed well with those reported by Farag (2004) and Abdalla *et al* (2008).

Changes in physicochemical properties of zagloul date during pickling process

The effect of pickling process on the PH, titratable acidity, pectin and tannins of green zagloul date fruits is shown in Table (3).

As shown in Table (3), PH, pectin and tannins decreased, while titratable acidity of date fruits and brining solution increased during the pickling period. It well known that during pickling process lactic acid content

Sensory evaluation of zagloul date products

The general appearance of zagloul date products are shown in Figs. (3 , 4).

A- Date Pickle

The sensory evaluation of the finished product of date pickle is shown in Table (4).

Table (4): Changes in sensory properties of date pickle during storage*

Storage period (work)	Characters				Overall Acceptability
	Colour	Taste	Texture	Odour	
2	8.13 ^a	7.60 ^a	8.20 ^a	7.87 ^a	8.0 ^a
4	8.0 ^a	7.86 ^a	8.13 ^a	7.93 ^a	8.07 ^a
6	8.13 ^a	7.86 ^a	8.33 ^a	8.00 ^a	8.20 ^a
8	8.46 ^a	7.93 ^a	8.06 ^a	8.33 ^a	8.27 ^a

* Means in the same column followed by the same letter(s) are not significantly different according to L.S.D. values 0.05

It was obvious that panelists accepted the green zagloul date pickle kept in the pickling solution even after 8 weeks of storage at ambient temperature (22 ± 2°C).

The panelists did not notice any significant differences in the studied organoleptic properties during this storage period.

B- Date Jam

The sensory evaluation of the finished products of date jam is shown in Table (5).



Fig (3): General appearance of date pickle (1) and date Jam (2)

C- Candied/ glazed/ chocolate coated date products

The sensory evaluation of the finished products of candied / glazed/ chocolate coated date products is shown in Table (6).

According to the obtained data it can be noticed that candied, Chocolate coated as well as candied, glazed and chocolate coated date products prepared by the two processes (slow open kettle process and the quick process) were more acceptable than the candied date only or the candied and glazed date products. The results indicated that glazing process followed by chocolate coating improved the organoleptic properties of candied date produced by the aforementioned processes. Also, the data revealed that no significant differences were noticed between candied chocolate coated and candied glazed chocolate coated date products prepared either by the slow or the fast process.

Table (6): Organoleptic Properties of Candied/ glazed/ chocolate coated date products*

Tested Products	Characters				Overall Acceptability
	Colour	Taste	Texture	Odour	
Candied					
1- Slow process	6.30 ^c	6.85 ^b	7.15 ^b	6.85 ^b	6.20 ^b
2- Fast process	7.30 ^b	6.50 ^b	7.35 ^b	7.06 ^b	6.80 ^b
Candied glazed					
1- Slow	6.85 ^{bc}	6.65 ^b	7.0 ^b	6.80 ^b	6.70 ^b
2- Fast	7.40 ^b	7.05 ^b	7.12 ^b	6.95 ^b	7.15 ^b
Candied, chocolate					
1- Slow	8.65 ^a	7.80 ^a	8.05 ^{ab}	8.15 ^a	8.25 ^a
2- Fast	8.40 ^a	7.70 ^{ab}	8.05 ^{ab}	7.95 ^a	8.15 ^a
Candied, glazed and chocolate coated					
1- Slow	8.65 ^a	8.05 ^a	7.85 ^a	8.40 ^a	8.45 ^a
2- Fast	8.50 ^a	8.40 ^a	8.15 ^a	8.25 ^a	8.40 ^a
L.S.D. 0.05	0.67	0.71	0.78	0.71	0.86

* Means in the same column followed by the same letter(s) are not significantly different according to L.S.D. values 0.05

1- slow open kettle process

2- Quick process

It may be concluded that date pickle, date jam as well as candied/ glazed/ chocolate coated date products with desirable sensory quality could be prepared from immature green zagloul date underneath the trees fruits (Kimri stage).

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REFERENCES

- Abdalla, M.Y.; Abo-El-sooud, A.A.; Ammar, M.E.F., Rashid, M.F and Saber, F.M.M. (2008). Palm tree: Agriculture and Service. (In Arabic) Agricultural Technical Report, Ministry of Agriculture, A.R.E.
- Abd El-Mohsen, M.M. and Nezam El-Din (1995). Technological study on dibis production from the Siwi date. Egyptian J. of Food Science 23 : 229 - 239
- Al-Hooti, S.; Sidhu, J.S.; Al-Otaib, J.; Al-Ameeri, H. and Qabazard, H. (1997a). Utilization of date fruits at different maturity stages for variety pickles. Advn. Food Sci. 19: 1 – 7.
- Al-Hooti; S.; Sidhu, J.S.; Al-Otaib, J.; Al-Ameeri, H. and Qabazard, H. (1997b). Processing of some important date cultivars grown in United Arab Emirates into chutney and relish. J. Food proc. Preserv. 21: 51 – 68.
- Al-Ogaidi, H.K., Albardie, J. and Abdel-Maseih, M. (1982). Possibility of pickling zahdi dates at al-kimri stage. J. of Research for Agric and water resources (Iraq) 1: 51 – 56.
- Association of Official Analytical Chemists (1990). Official Methods of Analysis AOAC 15th Ed. Washington DC, USA
- Dowson, V.H. and Aten, A. (1962). Date Handling, Processing and Packaging, FAO, Rome.
- El-Shaarawy, M.I.; Messalam, A.S.; Nakhal, H.M. and Wahdan, A.N (1986). Preparation of date drinks. Proceedings of 2^{ed} symposium on date palm in Saudi Arabia, KFU, Al-Hassa, 273 – 282.
- El-Shimi, N. M. and Hashimi, J. (1992). Utilization of date paste in cake product. Menofiya J. Agric. Res., 17: 1155 – 1168.
- Farag, K.M. (2004). Palm tree: Science, Culture and Tradition (In Arabic) Zayed center for tradition and History, UAE.
- Hamad, A.M., Mustafa, A.I. and Al-Kahtani, M.S. (1983). Possibility of utilize date syrup as a sweetening and flavouring agent in ice cream making. Proceedings of 1st symposium on date palm in Saudi Arabia, KFU, AL-Hassa, 544 – 550.
- Hamad, A.M. and Yousif, A.K. (1986). Evaluation of brine and salt-stock pickling of two date varieties in the kimri stage. Proceedings of 2^{ed} symposium on date palm in Saudi Arabia, KFU, Al-Hassa, 245 – 257.
- Hamad, A.M.; Al-Kanhal, H.A., and Al-Shaieb, I. (1986). Possibility of utilizing date purée and date pieces in the production of milk frozen desserts. Proceedings of 2^{ed} symposium on date palm in Saudi Arabia, KFU., Al-Hassa, 181- 187.
- Khalchadourian, H.A.; Sawaya, W.N.; Kalil, J.K.; Sali, W.M. and Mashadi, A.A. (1983). Utilization of dates (*Phoenix dactylifera L*) grown in the kingdom of Saudi Arabia in various date products. Proceedings of 1st symposium on date palm in Saudi Arabia, KFU., Al-Hassa, 504 – 518.
- Kulkarni, S.G., Vijayanand, P.; Aksha, M.; Reena, P and Ramana, K. V.R. (2008). Effect of dehydration on the quality and storage stability of immature dates (*Phoenix dactylifera*). LWT Food Sci. Technol. 41: 278 -283.
- Kulkarni, S.G.; Vijayanand, P. and Shubha, L. (2010). Effect of processing of dates into date Juice concentrate and appraisal of its quality characteristics. J. Food Sci. Technol. 47: 157 – 161.

- Minifie, B.W. (1982). Chocolate, Cocoa and Confectionery: Science and Technology. AVI Publishing CO. Westport Conn. Chicago, USA.
- Mustafa, A.I., Hamad, A.M. and Al-Kahtani, M. (1983). Date varieties for Jam productions. Proceedings of 1st symposium on date palm in Saudi Arabia, KFU., Al- Hassa, 496 – 502.
- Mustafa, A.I., Yousif, A.K. and Whadan, A.N. (1986). Utilization of date paste in bakery products. Proceedings of 2^{ed} symposium on date palm in Saudi Arabia, KFU. Al-Hassa, 207 – 218.
- Ragab, M.H.H.; El-Tabey Shehata, A. M. and Sedky, A. (1956). Studies on Egyptian dates. Chemical changes during development and ripening of six varieties. Food Technol. 10: 407 – 410.
- Ranganna, S. (1977). Manual of analysis of fruit and vegetable products. Mc Grow-Hill Pub. Co. LTd., New Delhi.
- Sawaya, W.N.; Safi, W.M.; Khalil, J.K. and Mashadi, A.S. (1983). Physical measurement, proximate analysis and nutrient elements content of twenty-five date cultivars grown in Saudi Arabia at the Khalal (Mature) and Tamer (Ribe) Stages. Proceedings of 1st symposium on date in Saudi Arabia, KFU, Al-Hassa, 454 – 467.
- Sawaya, W.N., Khalil, J.K.; Al- Shalhat, A.F. and Ismail, A.A (1986). Processing of glace dates. Proceedings of 2^{ed} symposium on date palm in Saudi Arabia, KFU, Al-Hassa, 113 – 120.
- Steel, R.G.D. and Torrie, J.H. (1980). Principles and Procedures of statistics, New York. Mc Graw-Hill.
- Yousif, A.K. and Al-Ghamdi, A.S. (1999). Suitability of some date cultivars for jelly making. J. Food Sci. Technol. 36: 515 – 518.

إنتاج وتقييم بعض المنتجات المحضرة من ثمار بلح الزغلول في مرحلة ما قبل النضج

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تنتشر زراعة نخيل الزغلول في جمهورية مصر العربية. ولقد تم الاستفادة من ثمار الزغلول المتساقطة تحت الأشجار في مرحلة ما قبل النضج (مرحلة الكمرى) لإنتاج بلح مخلل، مربى البلح والبلح المسكر. هذا وقد تم دراسة التركيب الكيماوى وكذلك دراسة التغيرات الحادثة أثناء مرحلة تخليل البلح الزغلول.

ولقد أثبتت الدراسة حدوث انخفاض تدريجى فى رقم الحموضة ونسبة كل من التانينات والبكتين فى حين حدثت زيادة تدريجية فى نسبة الحموضة التنقيطية محسوبة كحامض لاكتيك وذلك أثناء عملية التخليل. ولقد وجد أن جميع المنتجات المحضرة لاقت قبولا جيدا من حيث خواصها الحسية والتي تشمل اللون، الطعم، القوام، الرائحة، ودرجة التقبل العام.

كما أثبتت الدراسة إمكانية تحضير منتجات ذات قيمة غذائية ومقبولة حسيًا من ثمار البلح الزغلول المتساقطة تحت الأشجار فى مرحلة ما قبل النضج بحيث يمكن تسويقها على أنها منتجات خاصة.

الكلمات الدلالية: البلح المخلل، مربى البلح، البلح المسكر
قام بتحكيم البحث

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