

**CHEMICAL AND TECHNOLOGICAL STUDY ON EGYPTIAN
AMHAT DATE
1- EFFECT OF TEMPERATURE ON RIPENING
OF KHALAL DATE**

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Abstract

Egyptian Amhat dates in khalal stage were treated by different temperatures (40,60,65,70 and 80°C) for different periods. Treatments at 65°C and 70°C led to decrease total phenols and low molecular weight tannins which are responsible of astringent taste.

Organoleptic analysis revealed that treating khalal dates at 65°C and 70°C led to the best quality of ripening dates (color, taste and flavor).

INTRODUCTION

Amhat dates are popular soft date varieties in Egypt, which are used for local consumption in rutab stage. The production of this variety was 26371 tons in 1993 representing 4.17% of Egyptian national dates production.

Lot of work has been carried out on khalal dates of some varieties especially soft dates which had unacceptable taste during khalal stage. These dates are not acceptable to consumer due to their astringent taste of tannins besides the low content of sugars.

Yousif *et al.* (1983) found that cooking of Zahdi dates (semi - dry variety for 30-45 minutes was the proper time to produce khalal matbukh low in astringent taste.

Bent Aisha dates (soft variety) were changed from khalal to rutab stages by

freezing and heating as studied by Nezam El-Din, (1996a). Also, microwave heating was used to decrease the astringent taste and to change the khalal stage of Hayani dates to rutab dates as reported by Nezam El-Din, (1996b).

Amhat date variety contained 35.2% and 0.156% of total sugars and tannins respectively (khalifa, *et al.* 1984).

Khalal stage (yellow color) of Amhat date variety is not used as feeding fruit due to its high content of astringent tannins. So, this work aims to study the effect of different temperatures applied for different periods on the conversion of khalal dates to rutab dates (ripening dates).

MATERIALS AND METHODS

Early phase of khalal stage of Amhat dates (yellow color) were obtained from Abu-Rawash farms, Giza, Egypt during the season of 1995.

Khalal Amhat dates were subjected to different temperatures (40, 60, 65, and 80°C) in an oven for different periods (0.5, 1.0, 1.5, and 3.0 hrs).

Methods :

Moisture content was determined according to AOAC (1990). Ethanol 80% was used for extraction of reducing sugars. Arsenomolybdate and somogi cupper reagents were used for the determination of reducing and total sugars as mentioned by Somogi (1952) and Nelson (1974).

Free amino acids were determined according to Fahd (1972) and measured as isoleucine.

Total free phenols were determined by using Folin-Denis reagent as described by Swain and Hillis (1959). Simple phenols were separated and tannins were fractionated to low and high molecular weights using the method of Czochanska *et al.* (1979) then measured by Folin-Denis reagent.

Anthocyanidin was estimated by butanol-HCl method as reported by Bates (1977).

Organoleptic evaluation :

Data of 10 panelists for color, taste and flavor were tabulated and analyzed by statistical analysis (completely randomized design) as described by Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

Amhat date fruits are consumed in rutab stage only. So the fruits must be left on the tree until it completely ripened. Some treatments are done on khalal stage by dipping in solution of sodium chloride and/or acetic acid for converting it to rutab stage (FAO, 1994).

Treatments were carried out by subjecting the immature yellow fruits to different temperatures (40, 60, 65, 70 and 80°C) for different periods (0.5, 1.0, 1.5, and 3.0 hrs) in order to determine the best temperature and time for ripening.

Chemical evaluation :

Total solids of khalal Amhat date increased by increasing the exposure time for all the used temperatures as shown in table 1. and the rate of increase was more pronounced at high temperatures than at low temperatures.

Table 1. Total solids of treated khalal stage of Amhat date.

Period of ripening (hr)	Temperatures of ripening				
	40°C	60°C	65°C	70°C	80°C
0.5	30.0	30.6	30.7	31.2	31.6
1.0	30.0	31.6	32.5	33.8	35.0
1.5	30.3	34.1	34.7	34.9	37.5
3.0	30.7	35.1	35.3	36.0	47.3

Total solids of fresh khalal date were 30.0%.

Reducing sugars were increased by increasing the temperature from 40°C to 70°C while it decreased at 80°C. This decrease in sugars may be related to the non-enzymatic browning reaction between reducing sugars and free amino acids (Reynolds, 1965). Also, reducing sugars were increased by increasing time which may be related to liberation of sugars from soluble tannins (gallo-and ellagi-tannin) as reported by Haslam. (1966).

The decrease of total sugars at 80°C may be related to non enzymatic browning (Meyer, 1978). No decrease in total sugars were observed at 65°C and 70°C (Table 2).

Slight decrease in free amino acids were shown during different storage peri-

ods at 40°C and the decrease was more pronounced during different periods at 60, 65, 70 and 80°C (Table 3).

Table 2. Total and reducing sugars percentage of treated khalal date.

Period of ripening (hr)	Temperatures of ripening				
	40°C	60°C	65°C	70°C	80°C
0.5					
Total sugar %	68.3	68.5	68.8	68.9	67.3
Reducing sugar %	40.0	43.8	44.0	42.2	42.2
1.0					
Total sugar %	68.4	69.0	70.0	70.5	59.5
Reducing sugar %	36.5	44.0	58.7	59.6	57.3
1.5					
Total sugar %	69.0	70.1	70.2	71.4	55.6
Reducing sugar %	38.5	51.0	61.3	62.5	52.1
3.0					
Total sugar %	69.2	71.4	72.0	72.0	50.2
Reducing sugar %	39.8	61.3	71.0	71.4	47.0

The total and reducing sugars of fresh khalal Amhat were 68.3 and 35.9%
+ : the percentage measured on dry weight basis.

Total free phenols :

From table 3 it can be seen that total free phenols decreased at 40, 60, 65, 70 and 80°C by increasing the time of treatment. This decrease may be related to the effect of polyphenol oxidase on free phenols to form melanin pigment (Meyer, 1978) but the decrease at high temperature (80°C) may be related to non-enzymatic browning reaction between phenolic amino acids (i.e. phenyl alanine, tyrosine) and reducing sugars (Reynolds, 1965).

It can be observed from table 3 that simple phenols decreased markedly by increasing the time. This decrease may be related to the enzymatic browning reaction (Meyer, 1978), but at high temperature the decrease of simple phenols may be related to the non-enzymatic browning reaction as previously mentioned.

Tannin content :

Low molecular weight tannin which are responsible for the astringent taste

Table 3. Free amino acids⁺ (FAA), total and simple phenols percentage⁺ of treated khalal date

Period of ripening (hr)	Temperatures of ripening				
	40°C	60°C	65°C	70°C	80°C
0.5					
FAA %	3.12	3.01	2.91	2.80	2.56
TPH %	2.89	2.51	2.33	2.19	2.18
SPH %	1.20	1.18	1.08	1.06	1.00
1.0					
FAA %	3.11	2.75	2.61	2.52	2.44
TPH %	2.80	2.30	2.10	2.00	1.97
SPH %	1.26	1.18	1.08	1.07	1.00
1.5					
FAA %	3.10	2.54	2.35	2.23	2.16
TPH %	2.70	2.04	1.77	1.74	1.66
SPH %	1.18	1.07	1.03	0.97	0.85
3.0					
FAA %	3.00	2.40	2.20	2.10	2.06
TPH %	2.60	1.81	1.66	1.44	1.27
SPH %	1.06	1.01	0.97	0.91	0.72

FAA : free amino acids TPH : total phenols SPH : simple phenols

Total and simple phenols measured as gallic acid, on dry basis

Fresh Amhat khalal date contained 3.439, 289 and 1.28% of FAA, TPH and SPH respectively.

with other soluble tannin compounds (i.e gallo-ellagi-tannin) was decreased clearly at 65°C and 70°C, while the decrease at 40°C and 80°C were very low (Table 4).

High molecular weight tannins were increased by increasing the temperature and time, these increase may be related to the effect of heating on the changes of low molecular weight to high molecular weight tannins (Maier and Metzler, 1965) as showed in table 4.

Anthocyanidin contents were increased by increasing the treatment period at 60, 65, and 70°C but it decreased at 80°C by increasing the time of the treatment which may be attributed to the degradation of previous compounds at high temperature (Table 4).

Table 4. Tannin contents of treated khalal date

Period of ripening (hr)	Temperatures of ripening				
	40°C	60°C	65°C	70°C	80°C
0.5					
Sol.T.	1.690	1.330	1.250	1.130	1.180
LMW %	0.047	0.042	0.032	0.030	0.035
HMW %	0.200	0.230	0.248	0.282	0.411
ANTH %	0.390	0.411	0.424	0.544	0.600
1.0					
Sol.T.	1.540	1.120	1.020	0.930	0.970
LMW %	0.043	0.033	0.024	0.020	0.034
HMW %	0.220	0.253	0.262	0.298	0.428
ANTH %	0.390	0.450	0.491	0.570	0.525
1.5					
Sol.T.	1.620	0.970	0.740	0.770	0.810
LMW %	0.039	0.026	0.20	0.016	0.031
HMW %	0.230	0.285	0.300	0.330	0.443
ANTH %	0.398	0.469	0.552	0.627	0.406
3.0					
Sol.T.	1.540	0.800	0.690	0.530	0.550
LMW %	0.035	0.020	0.009	0.004	0.028
HMW %	0.260	0.388	0.402	0.411	0.498
ANTH %	0.410	0.620	0.730	0.780	0.085

All percentages are measured on dry weight basis.

Sol. T. : Soluble tannin (measured by subtracting the simple phenols from total free phenols).

LMW : low molecular weight tannin

HMW : high molecular weight tannin.

ANTH : anthocyanidin. LMW and HMW measured as catechin

Ahmat khalal date contained 0.050, 0.18 and 0.386% of LMW, HMW and ANTH respectively.

Organoleptic evaluation :

From table 5. it was found that the treatments at 65°C and 70°C had the maximum mean values for flavor and taste. Previous treatments had significant differences than other treatments. Treated dates at 80°C led to the best color and treatments at 65°C and 70°C had good color mean values which were more significant than the treatments at 40°C and 60°C.

So the best temperatures used for improving the ripening of dates were 65°C and 70°C. These temperatures led to the acceptable taste and flavor through the reduction of the astringent compounds (soluble tannins) and their effects on increasing the reducing sugars which led to increase the sweetness (Table 5).

It can be concluded that the temperatures of 65°C and 70°C are very suitable to ripen the khalal date at early stage but ripening by acetic acid and sodium chloride are used only at the late phase of khalal stage.

Table 5. The means of color, taste and flavor of treated khalal date after 3 hr. at different temperatures .

	Temperatures of ripening					LSD	
	40°C	60°C	65°C	70°C	80°C	5%	1%
Color	2.750	4.875	6.375	7.125	7.500	0.709	0.952
Taste	1.375	3.750	6.750	7.875	4.375	0.656	0.880
Flavor	1.785	3.750	7.375	8.000	5.250	0.723	0.969

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دراسة كيميائية وتكنولوجية علي البلح الامهات ١- تأثير درجة الحرارة علي انضاج البلح خلال (الاصفر)

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معهد بحوث تكنولوجيا الأغذية - مركز البحوث الزراعية - جيزة - مصر.

لقد تم دراسة تأثير معاملة البلح الأمهات في مرحلة الخلال بدرجات حرارة مختلفة (٤٠ ، ٦٠ ، ٧٥ ، ٧٠ ، ٨٠ °م) كل علي حده ولفترات زمنية مختلفة لانضاج التمور واعطاء طعم البلح الرطب لنفس الصنف ، ولقد وجد ان درجتا الحرارة ٦٥ °م ، ٧٠ °م قد أديا الي خفض الفينولات الحرة الكلية والتاتينات ذات الوزن الجزيئي المنخفض المسؤولة عن الطعم القابض.

باجراء التحاليل الحسية وجد أن البلح الأمهات خلال المعامل عند ٦٥ °م ، ٧٠ °م أظهر أفضل جودة انضاج من حيث الطعم والنكهة واللون.