

## Physicochemical and Sensory Evaluation of Dhakki Dates Candy

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### Abstract

The experiment was conducted to develop candy from Dhakki dates picked at Khalal stage. Physicochemical and sensory characteristics like moisture, pH, TSS, color, flavor, texture and overall acceptability were studied for total period of six months. Candy was prepared from 5 different sugar concentrations, i.e. T0 (control), T1 (20%), T2 (40%), T3 (60%), and T4 (70%). Among them, best treatment was identified on the basis of overall acceptability. Candy prepared from T3 (60%) proved to be best but the candy prepared from T2 (40%) was equally good. The least acceptable was the candy of T1 followed by T4. Sensorial properties, moisture and pH decreased while TSS increased during six months of storage. Candy packed in HDPE bags can be kept safely up to six months.

**Keywords:** Physicochemical, Sensory properties, Sucrose, Khalal stage

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### Introduction

Date palm (*Phoenix dactylifera* L.) is an important fruit crop known from centuries as a high energy food and desert. The nutritional value of date is high since it contains sugar, minerals and vitamins<sup>[1]</sup>. Sugars contain more than 70% of dry weight and are an important nutrient in dates. Dates play an important role in both mental and sexual activities. They also provide protection against age related problems which may be contributed to their high content of antioxidant compounds<sup>[2]</sup>. Carbohydrates, vitamins and minerals rich dates are good not only for humans but can also be used as a feed supplement for live-  
stocks<sup>[3-5]</sup>.

Asia stands first among region with 60 millions date palms mostly grown in Saudi Arabia, Bahrain, Oman, Pakistan, Iran, Iraq and Yemen followed by African region with 32.5 million date palms. Mexico and USA have 600,000 date palms followed by Europe and Australia with 320,000 and 30,000 date palms respectively<sup>[6]</sup>.

Pakistan was the 5<sup>th</sup> largest date producer with an annual production of 600,000 t in 2012 which may be contributed to the increase in cultivation of area of date palms in 2012<sup>[7]</sup>. Many varieties are grown in Pakistan and some cultivars are grown in specific areas, like Dhakki in Dera Ismail Khan, Begum Jhangi in Panjgur and Aseel in Khairpur, all have the capability to compete with the world dates<sup>[8]</sup>.

Among the local varieties in Dera Ismail Khan Dhakki is very popular for its jumbo size and weight with pleasure taste and texture<sup>[9]</sup>. Consumer demand for Dhakki dates is increasing rapidly in Dera Ismail Khan<sup>[10]</sup>.

But the problem with Dhakki date in Dera Ismail Khan is that, monsoon rains occurs from July to September, which coincide with the date ripening season in the area. Date palm is mainly sensitive to rain from khalal (maturity) to rutab and Tamar (ripening). Rain can easily deteriorates dates within 2 days, at late khalal stage cracks in epicarp can appear even in hours. At early khalal stage, rain does not cause any damage and even may have a beneficial effect by washing dirt and dust<sup>[11]</sup>.

To overcome these problems many studies have been carried out on date palm by-products like date pickles, jams, date syrup, ice creams, chocolates and date paste<sup>[12-14]</sup>.

Yousif et al. (1987)<sup>[15]</sup> conducted his research on the possibility of using date paste as a replacer for caramel or sugar paste in preparing candy bars. Processing conditions, nutritive value and organoleptic properties of the prepared date bars as well as their storability were evaluated. The results indicated that the prepared date bars either plain or chocolate coated had good acceptability, possessed a high nutritive value and could be stored for more than 5 months under refrigeration (5° C) without affecting their qualities.

Candy or confectionary is popular food item. Most of fruit candies available in market are imported. The availability of dates in substantial quantities in Dera Ismail Khan justify their use in various products and processing plain which can be used as a replacer for dates when the season is off.

Therefore, the objectives of the present study were to develop date candy from dhakki variety using different sugar concentration and to assess its quality in order to make the product available through the year, to generate income and improve marketability of the dates in a proper way for the benefits of farmers.

## Materials and Methods

The experiment was conducted in month of August 2016, at Agriculture Research Institute Dera Ismail Khan. Dhakki dates at khalal stage were picked from the orchard of Agriculture Research Institute Dera Ismail Khan and brought to laboratory of Food Technology Section.

### Preparation of dhakki date candy

The dates were steeped in 0% sugar syrup for one day and then syrup was drained and dates were dried. Sugar was added to the syrup until TSS reached 20% and dates were steeped for 24 hrs. After 24 hr's dates were removed from syrup and dried. Syrup having 20% total soluble solids was boiled till TSS reached 40%, the dates were kept in that 40% syrup for one day. This process continued till the TSS of syrup reached 70%. At 70% TSS the dates were kept for about 48 hrs. At each level of TSS i.e. 0%, 20%, 40%, 60% and 70% the syrup was drained from dates and dried in mechanical dehydrator at 60°C till moisture content of < 16% is achieved. In the preparation of candy osmotic dehydration step prior to drying was used as described by Ramamurthy et al. (1970)<sup>[16]</sup>. The drying time requirement was similarly followed as described by Islam and Flink (1982)<sup>[17]</sup>.

### Treatments

T<sub>0</sub> = Control

T<sub>1</sub> = Dates + 20% sugar syrup+ 0.1% potassium metabisulphite

T<sub>2</sub> = Dates + 40% sugar syrup+ 0.1% potassium metabisulphite

T<sub>3</sub> = Dates + 60% sugar syrup+ 0.1% potassium metabisulphite

T<sub>4</sub> = Dates + 70% sugar syrup+ 0.1% potassium metabisulphite

### Storage

Prepared date candy of different treatments were then wrapped in polyethylene bags and kept in cool airtight boxes for storage and further analysis.

### Chemical analysis

The date candies were analyzed for moisture, pH and total soluble solids according the official standard method (AOAC 2003)<sup>[18]</sup>.

### Sensory analysis of date candy

For statistical analysis samples were evaluated for moisture, pH, TSS, and sensory evaluation for color, flavor, texture and overall acceptability was performed by panel of 9 members. The samples were presented to 9 members. The members were asked to rate the different composition presented to them on a 9 point hedonic scale with the ratings of: 9 = Like extremely; 8 = Like very much; 7 = Like moderately; 6 = Like slightly; 5 = Neither like nor dislike; 4 = Dislike slightly; 3 = Dislike moderately; 2 = Dislike very much; and 1 = Dislike extremely. The result was analyzed by statistical software (statistix).

## Result and Discussion

### Moisture

The results of changes in moisture content of dhakki date candy during storage are presented in **Table I**. A significant decrease was observed in moisture content during total period of storage. The moisture content decreased significantly ( $p < 0.05$ ) from 15.4 to 12.5 during total storage interval. For treatment the highest mean was observed in T<sub>2</sub> (14.9) while minimum was recorded in T<sub>3</sub> (12.8).

**Table I.** Effect of storage period and treatments on (%) moisture of date candy.

Treatment	Storage Interval							% Dec	Mean
	0	30	60	90	120	150	180		
T <sub>0</sub>	16.14	15.02	14.23	13.67	13.04	12.35	12.00	25.65	13.7d
T <sub>1</sub>	15.18	15.00	14.56	14.12	13.78	13.13	12.45	17.98	14b
T <sub>2</sub>	16.77	16.12	15.44	14.89	14.10	13.77	13.33	20.51	14.9a
T <sub>3</sub>	14.16	13.68	13.12	12.78	12.22	12.00	11.89	16.03	12.8e
T <sub>4</sub>	14.87	14.45	14.12	13.78	13.44	13.14	12.89	13.32	13.8c
Mean	15.4a	14.8b	14.2c	13.8d	13.3e	12.8f	12.5g		

The decrease in moisture content may be due to evaporation during storage. Variation in loss of moisture can due to variation in treatment. Chavan et al. (2010)<sup>[19]</sup> reported a decreasing trend in moisture content of osmo dried banana slices during six month storage.

**Means followed by different letters are significant ( $P \leq 0.05$ ).**

**pH:** The mean value of pH decreased from 5.63 to 4 during total period of storage. Highest mean value for treatment was observed in T<sub>1</sub> (4.84) while the minimum value was observed in T<sub>2</sub> (4.4) as presented in **table II**. During storage highest percent decrease was observed in T<sub>2</sub> (39.15) while lowest fall was recorded in T<sub>4</sub> (20.74).

**Table II.** Effect of storage period and treatment on pH of date candy.

Treatment	Storage Interval							% Dec	Mean
	0	30	60	90	120	150	180		
T <sub>0</sub>	5.96	5.67	5.14	4.67	4.35	4.11	4.00	32.89	4.81c
T <sub>1</sub>	5.46	5.35	5.13	4.97	4.66	4.37	4.14	24.13	4.84bc
T <sub>2</sub>	5.67	5.35	5.16	4.03	3.88	3.76	3.45	39.15	4.4d
T <sub>3</sub>	5.70	5.37	5.21	5.09	4.79	4.56	4.30	24.56	5a
T <sub>4</sub>	5.40	5.26	5.08	4.91	4.76	4.49	4.28	20.74	4.83b
Mean	5.63a	5.4b	5.1c	4.7d	4.4e	4.2f	4g		

The decrease during total period of storage might be due to increase in acidity and can also be contributed to some other chemical reactions. Natalia et al. (2012)<sup>[20]</sup> also observed a decreasing trend in pH during storage while studying apple leather. Means followed by different letters are significant ( $P \leq 0.05$ ).

**TSS:** The mean value for TSS increased from 66.6 to 69.5 during total period of storage (**Table III**). Highest mean value for treatment was recorded in T<sub>4</sub> (74.2) while minimum score was recorded in T<sub>0</sub> (47.6). Highest percent increase was recorded in T<sub>1</sub> (5.14) while minimum increase was observed in T<sub>0</sub> (3.11).

**Table III.** Effect of storage period and treatments on TSS of date candy.

Treatment	Storage Interval							% Inc	Mean
	0	30	60	90	120	150	180		
T <sub>0</sub>	45.14	45.34	45.61	45.92	46.13	46.37	46.59	3.11	47.6e
T <sub>1</sub>	71.12	71.79	72.36	73.12	73.79	74.37	74.97	5.14	71.7d
T <sub>2</sub>	72.18	73.20	73.76	74.11	74.57	74.97	75.34	4.19	73.6b
T <sub>3</sub>	72.25	72.78	73.23	73.47	73.88	74.35	74.80	3.41	73.5c
T <sub>4</sub>	73.12	73.57	73.98	74.25	74.56	74.88	75.65	3.34	74.2a
Mean	66.6g	67.2f	67.7e	68.2d	68.5c	69b	69.5a		

The increase in Total soluble solids might be due to the conversion of starch and other insoluble carbohydrates into sugar and may also be due to the loss of moisture that tends to increase TSS. A similar increasing trend was observed by Phimprian et al. (2011)<sup>[21]</sup> reported an increase in TSS (from 82.42 - 86.9) while studying apple leather.

**Means followed by different letters are significant ( $P \leq 0.05$ ).**

**Color:** The mean score of judges for color significantly ( $p < 0.05$ ) decreased from 8.7 to 5.2 during storage (**Table IV**). For treatment maximum mean score was observed in T<sub>3</sub> (8.0) while minimum mean score was observed in T<sub>0</sub> (2.7).

**Table IV.** Effect of storage period and treatments on color of date candy.

Treatment	Storage Interval							% Dec	Mean
	0	30	60	90	120	150	180		
T <sub>0</sub>	8	5	2	1	1	1	1	87.50	2.7c
T <sub>1</sub>	9	8.7	8.5	8	7.3	6	5	44.44	7.5b
T <sub>2</sub>	9	8.8	8.4	8	7.5	7.2	7	22.22	7.9a
T <sub>3</sub>	9	8.5	8.2	8	7.7	7.5	7.1	21.11	8.0a
T <sub>4</sub>	8.6	8.2	7.8	7.4	7	6.6	6	30.23	7.3b
Mean	8.7a	7.8b	6.9c	6.4d	6.1e	5.6f	5.2g		

Color of T<sub>3</sub> was comparatively attractive during storage period at ambient temperature. Similar results have been reported by Durrani et al. (2011)<sup>[22]</sup> in development and quality evaluation of honey based carrot candy that osmotic drying had a protective effect upon the color and flavor of fully dried fruits.

**Means followed by different letters are significant (P ≤ 0.05).**

**Flavor:** Flavor is a vital quality factor that determines the consumer attraction to the product. The results pertaining to the response of flavor on the storage interval of the candies prepared from dhakki dates are presented in **Table V**.

**Table V.** Effect of storage period and treatments on flavor of date candy.

Treatment	Storage Interval							% Dec	Mean
	0	30	60	90	120	150	180		
T <sub>0</sub>	6.5	1.0	1.0	1.0	1.0	1.0	1.0	84.62	1.7c
T <sub>1</sub>	9.0	8.5	8.0	7.6	7.3	7.0	6.5	27.78	7.7ab
T <sub>2</sub>	8.8	8.5	8.1	7.7	7.2	7.0	6.8	22.73	7.6a
T <sub>3</sub>	9.0	8.8	8.3	7.6	7.1	6.8	6.5	27.78	7.4ab
T <sub>4</sub>	9.0	8.5	8.1	7.6	7.2	6.8	6.2	31.11	7.6b
Mean	8.47a	7.06b	6.7c	6.3d	5.9e	5.7f	5.4g		

The mean score of judges for flavor significantly ( $p < 0.05$ ) decreased from 8.47 to 5.4 during total period of storage. For treatment maximum mean score was observed in T<sub>1</sub> (7.7) while minimum mean score was observed in T<sub>0</sub> (1.7). These results were in harmony with the observation of Dermesonlouoglou et al. (2006)<sup>[23]</sup> who reported 54.55% decrease in flavor scores of osmo- dehydrofrozen tomatoes, during 12 months storage.

**Means followed by different letters are significant (P ≤ 0.05).**

### Texture

Originally the mean score of juries for texture of date candy from T<sub>0</sub> to T<sub>4</sub> was 9 for all, which was progressively reduced to 1, 6.5, 6.1, 6.7, and 6.1 correspondingly during the total period of storage.

The mean score of judges for texture significantly ( $p < 0.05$ ) decreased from 9.00 to 5.2 during storage as presented in **Table VI**. For treatments maximum mean score was observed in T<sub>3</sub> (7.9), while minimum was recorded in T<sub>0</sub> (2.2). The highest percent decrease was observed in T<sub>0</sub> (88.89) while minimum was observed in T<sub>3</sub> (25.56). Similar results were observed by Muhammad et al. (2007)<sup>[24]</sup> during storage of pear glaces.

**Table VI.** Effect of storage period and treatments on texture of date candy.

Treatment	Storage Interval							% Dec	Mean
	0	30	60	90	120	150	180		
T <sub>0</sub>	9.0	2.0	1.0	1.0	1.0	1.0	1.0	88.89	2.2e
T <sub>1</sub>	9.0	8.3	8.0	7.6	7.3	7.0	6.5	27.78	7.6b
T <sub>2</sub>	9.0	8.5	8.0	7.6	7.2	6.7	6.1	32.22	7.5c
T <sub>3</sub>	9.0	8.7	8.3	8.0	7.6	7.1	6.7	25.56	7.9a
T <sub>4</sub>	9.0	8.3	8.0	7.4	7.1	6.5	6.1	32.22	7.4d
Mean	9a	7.1b	6.6c	6.3d	6e	5.6f	5.2g		

Means followed by different letters are significant ( $P \leq 0.05$ ).

### Overall acceptability

The results on changes in overall acceptability of dhakki date candy during storage are presented in **Table VII**. A mean overall acceptability score of all treatments was found to gradually decrease from 8.3 to 5.2 during storage which may be due to reduction in score of color, flavor, and texture of date candy. For treatment maximum mean score was observed in  $T_2$  and  $T_3$  both having value of 7.7 while minimum score was observed in  $T_0$  (1.8).

**Table VII.** Effect of storage period and treatments on overall acceptability of date candy.

Treatment	Storage Interval							% Dec	Mean
	0	30	60	90	120	150	180		
$T_0$	6.0	2.0	1.0	1.0	1.0	1.0	1.0	83.33	1.8d
$T_1$	9.0	8.5	8.1	7.7	7.4	6.6	6.0	33.33	7.6b
$T_2$	9.0	8.6	8.1	7.7	7.3	6.9	6.6	26.67	7.7a
$T_3$	9.0	8.6	8.2	7.8	7.3	6.9	6.5	27.78	7.8a
$T_4$	8.8	8.3	7.9	7.4	7.1	6.6	6.1	30.68	7.4c
Mean	8.3a	7.2b	6.6c	6.3d	6e	5.6f	5.2g		

Chavan et al. (2010)<sup>[19]</sup> reported that a gradual decrease in overall acceptability score from 8.40 to 7.80 during six month storage may be due to reduction in score of colour and appearance texture, taste of osmo-dried banana slices.

Means followed by different letters are significant ( $P \leq 0.05$ ).

### Conclusion

The different sugar solutions significantly affected the quality of date candy. The best quality date candy was that prepared with 60% ( $T_3$ ) sugar solution, followed by  $T_2$ . The color, flavor and texture of date candy with 60% and 40% sugar solutions were preferred by the judges because of unique and sweat flavor. The color was excellent; taste was sweat, and a tender texture. From the results it can be concluded that there is possibility of for utilization of surplus dates in candy making.

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