

## BIOCHEMICAL COMPOSITION OF DATES AND DATE SYRUP

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Nutritional quality characteristics of six date cultivars were determined. The results indicate that Bodaywala dates contained highest average weight (8.9g) per date and the Jhajri date stone contained highest average weight (1.0g) per stone. Dona was the sweetest with 83% total soluble solids. The maximum pulp (91%) and date stone (24%) was recorded for Bodaywala and Waniwala respectively. Data on the yield of date syrup (72° Brix) revealed that Basra was the best in quality. Other quality parameters studied were moisture, crude protein, crude fat, carbohydrates, crude fibre and ash. Date-syrups were analysed for mineral elements (calcium, phosphorous, sodium, potassium, copper, iron, manganese and zinc). Glucose and fructose contents of the syrups were also determined.

*Key words:* Date cultivars, Date syrups, Mineral elements and sugars.

### INTRODUCTION

Dates (*Pheonix dactylifera* L.) require a hot, dry climate and abundant water, as in some parts of Baluchistan Sind, Punjab, and N.W.F.P. Total annual production of dates is 234200 tonnes in Pakistan [1]. Dates are popular in Pakistan and Middle East. Over 70% of the total world production is obtained from Middle East, and are a major source of readily available energy and other nutrients, especially for the desert dwellers. The chemical composition of dates have been reported from various parts of the world [2-7]. Most of the data pertain to the flesh of the fruit. Little work has been done in Pakistan. There is a wide variety of dates produced in the world. Dates are of three types, [8], (a) dry dates with sucrose as the predominant sugar, (b) semidry dates, in which sucrose and invert sugars both present in comparable amounts, (c) soft dates, in which invert sugar predominate. Studies on improving the quality of date syrup have been reported by some workers [9]. The objective of the present work was to investigate selective quality characteristics of six major cultivars of dates as well as date syrups.

### MATERIALS AND METHODS

*Preparation of samples.* Dates cultivars locally known as; Basra, Bodaywala, Dona, Jhajri, Lahorwala and Waniwala were obtained from different date palm plantations in Dera Ismail Khan Division of NWFP. The fruit samples of each cultivar were taken at random and used for making syrups and subsequent physico-chemical analysis.

*Physical characteristics.* An average weight of date was determined from randomly selected 20 whole fruits in each

case. The dates were depitted manually and the seeds cleaned. The cleaned stones were weighed for such cultivars. Total soluble solids of dates and date syrup were measured using an Abbes refractometer, at room temperature and values were corrected at 20°. The percentage of pulp and date stones were calculated by difference method.

*Chemical analysis.* Moisture, crude protein (Nx 6.25), crude fat, crude fibre ash and carbohydrates (by difference) were determined in the flesh of the fruits according to the standard methods of the A.O.A.C. [10]. For mineral assay, 5-10 g sample of date syrup was dried, ashed and dissolved in 5 ml 20% HCl. Samples were diluted with deionized water. Eight mineral elements were determined. Calcium, sodium and potassium were analysed by a flame photometer (Gallenkamp). Phosphorous was determined spectrophotometrically [10] copper, iron, manganese and zinc, were determined with a Hitachi model 170-10 atomic absorption spectrophotometer.

*Preparation of date syrup.* Five kg dates of each variety were separately depitted manually and the flesh minced in meat mincer. The minced material was treated with 0.026% potassium metabisulphite and 0.05% pectolase. The mixture was kept overnight at ambient temperature. Juice was extracted by pressing the meshed in a mass hydraulic press 4%. Activated charcoal was added to the juice and the mixture was heated to 80° for 50-60 minutes. For inactivating of the enzyme used. The juice was filtered through cellite bed and the resulting clear solution concentrated in a cyclone evaporator to about 72° Brix. The concentrate was packed and weighed in pre-sterilized bottles. The percentage of date syrup was calculated.

*Invert sugar analysis.* The dates and date syrup were

analysed for sugars such as glucose and fructose using colorimetric method [11].

RESULTS AND DISCUSSION

*Physical characteristics.* The average weight, total soluble solids, pulp, stone and yield of 72° Brix date syrup are given in Table 1. The mean, standard deviation

Table 1. Physical characteristics\* of date cultivars and their syrups.

	Weight of*		T.S.S. %	Pulp %	Stone %	Syrup** yield %
	Date g	Stone g				
Basra	7.0	1.0	81	86	14	48.0
Bodaywala	8.9	0.9	80	91	9	45.2
Dona	7.8	0.9	83	88	12	45.0
Jhajri	6.9	1.00	80	85	15	38.0
Loharwala	5.6	0.9	71	84	16	46.0
Waniwala	2.9	0.9	79	76	24	32.0
Mean	6.5	0.9	79	85	15	42.4
Standard deviation	1.9	0.1	3.8	4.6	4.6	5.6
Coefficient of variation	29.2	5.4	4.8	5.4	30.7	13.2

+ Mean of triplicate determinations on as is basis., \* Mean of 20 dates or date stones., \*\* Syrup of 72° Brix.

and coefficient of variation were also determined. It was observed that Bodaywala and Waniwala exhibited heaviest and lightest per date weights (8.9g and 2.9g) respectively. There was no significant difference between the stone weight among the cultivars. Total soluble solids were highest in Dona at 83% and lowest in Loharwala at 71%. Data on stone percentage revealed that 24% Waniwala stone was maximum and 9% Bodaywala stone was minimum. Basra and Waniwala yielded the highest and lowest date syrup (48% and 32%) respectively. The overall results showed that Bodaywala date contained (a) maximum date weight (b) highest pulp percentage. (c) lowest date stone percentage and was second to Basra in syrup yield. On the other hand Waniwala date contained (a) lowest date weight (b) lowest pulp (c) maximum stone (d) lowest syrup yield.

*Proximate composition.* Proximate composition data (Table 2) showed variations in the values in different varieties. The highest and lowest moisture contents of 17% and (9.4%) was of Bodaywala and Dona cultivars respectively. Crude protein contents (Nx6.25) ranging from 2.4%

Table 2. Proximate composition\* of edible portion of date cultivars.

	Moisture %	Protein %	Fat %	Carbo- hydrates %	Fiber %	Ash %
Basra	10.0	2.0	0.6	84	2.3	1.1
Bodaywala	9.4	2.1	0.6	85	2.0	0.9
Dona	9.4	2.4	0.5	84	2.4	1.3
Jhajri	10.7	2.2	0.5	84	1.6	1.0
Loharwala	11.6	1.8	0.3	83	2.2	1.1
Waniwala	17.0	2.1	0.4	77	2.3	1.2
Mean	11.4	2.1	0.5	82.8	2.1	1.1
Standard deviation	2.6	0.2	0.1	2.7	0.3	0.1
Coefficient of variation	23.3	8.7	22.1	3.2	12.6	11.7

\* Means of triplicate determinations on as is basis.

and 1.8% in Lahorwala and Dona varieties. Similarly maximum crude fat (0.6%) was in Basra and Bodaywala with minimum (0.3%) in Lahorwala. Crude fibre was highest (2.4%) and lowest (1.6%) in Dona and Jhajri respectively. Ash ranged between Dona (1.3%) to Bodaywala (0.9%). Carbohydrates were maximum (85%) in Bodaywala and lowest (77%) in Waniwala.

*Mineral analysis.* Results of mineral analysis (Table 3) showed that K was the most abundant mineral in six date syrups, and P was the next in concentration. Sodium was least abundant. (In this study of dates the K: Na ratio is 664:1 about 4 times that of citrus fruits prescribed in diets to corrects electrolyte balance [12]), while Fe was highest as microelements (Table 3) in date syrup followed by Mn, Cu, and Zn. Date syrup (Table 3) of Jhajri, Dona and Basra cultivars were highest in Ca P, Na, K, Cu, Fe, Mn and Zn respectively. Date syrup of Bodaywala Dona and Waniwala were poor in micro nutrients. The data indicates that date syrups and dates have a significant amount of the mineral elements the important nutritional ingredients.

*Invert sugars analysis.* Results of invert sugars i.e. glucose and fructose of syrups prepared from Basra, Bodaywala, Dona, Jhajri, Loharwala and Waniwala are given in Table 4. The syrups generally belong to a group, commonly called soft dates, with invert sugars predominate. Invert sugars "Glucose + Fructose" and fructose alone was maximum in Basra syrup while minimum in Bodaywala syrup.

From the biocomposition and commercial points of view, dates have a good potential for production of date syrup. It could be a reasonable good and profitable business

Table 3. Mineral elements\* in syrups of date cultivars

	Copper mg/100g	Iron mg/100g	Manganese mg/100g	Zinc mg/100g	Calcium mg/100g	Phosphorus mg/100g	Sodium mg/100g	Potassium mg/100g	K: Na
Basra	1.51	2.43	2.57	0.30	97	123	1.6	1160	725:1
Bodaywala	0.91	3.67	0.89	0.39	76	112	1.2	820	683:1
Dona	1.24	4.40	3.36	0.53	79	98	1.5	810	540:1
Jhajri	2.30	2.76	6.39	0.54	104	143	1.5	1010	673:1
Loharwala	0.98	2.28	2.54	0.29	82	112	1.3	1120	862:1
Waniwala	2.00	2.05	0.89	0.26	91	100	1.1	750	682:1
Mean	1.49	2.93	2.77	0.39	88.2	114	1.4	945	664:1
Standard deviation	0.51	0.84	1.85	0.11	10.1	15.2	0.2	160	—
Coefficient of variation	34.39	28.49	66.84	29.41	11.4	13.2	13.1	17	—

\* Mean of duplicate results

Table 4. Glucose and fructose\* in syrups of date cultivars.

	Invert sugars %	Fructose %	Glucose %	Fructose to glucose ratio
Basra	98.3	48.2	50.1	1:1.04
Bodaywala.	78.9	37.2	41.7	1:1.12
Dona	87.7	46.4	41.3	1:0.89
Jhajri.	93.7	46.5	47.2	1:1.02
Loharwala	94.7	43.9	50.8	1:1.16
Waniwala	88.7	43.7	45.0	1:0.94
Mean	90.3	44.3	46.0	1:1.03
Standard deviation	6.2	3.5	3.7	—
Coefficient of variation	6.9	8.0	8.1	—

\* Mean of duplicate determinations

in date growing areas of Pakistan. The product will partially replace the use of honey and jams, jellies and marmalades used for break fast.

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