

## PHYSICO-CHEMICAL AND ORGANOLEPTIC CHARACTERISTICS OF BISCUITS ENRICHED WITH DATE POWDER

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### ABSTRACT:

The study was carried out during 2018 at laboratory of Institute of Food Sciences and Technology, Sindh Agriculture University, Tandojam to evaluate the physico-chemical and organoleptic characteristics of biscuits enriched with date powder. The treatments included: T1= 0% without date powder (control), T2= 50% date powder and T3= 100% dates powder. Some chemical parameters were studied which included moisture (%), ash (%), TSS (<sup>o</sup>Brix), pH value, vitamin C mg g<sup>-1</sup>, protein (%), carbohydrates (%), fat (%) and crude fiber (%) per 100 mg. The control (T1) with 0% date powder (control) resulted in 2.44% moisture, 0.30% ash, 9.50<sup>o</sup>Brix total soluble solids, 5.60 pH value, 16.92 mg/100g vitamin C, 32.61% fat, 0.02 per 100 mg crude fiber, 18.59% protein and 44.37% carbohydrate. The sensorial analysis indicates that numerical high score of color (8.36), flavor (8.60), texture (7.86), taste (8.50) and overall acceptability (8.06) was recorded in biscuits enriched with 100% dates powder followed by biscuits with 50% date powder with average score of color (7.46), flavor (7.53), texture (7.60), taste (7.46) and overall acceptability (7.56)

**Keys: physico-chemical, organoleptic characteristics of biscuits**

### INTRODUCTION

Biscuits have always been a popular, appealing food product due to their thrilling and textured features, compactness, convenience and cost competitiveness. They have lower moisture content than cakes and bread, and are protected from microbiological damage and have a longer shelf life. Usman *et al.*, (2015) reported that it is high in calories, low proteins, low in fibre and hence, are not considered in healthy food category especially for aged, diabetic and obese people, significant amount of fat which is not good for peoples which diabetics (Mishra and Chandra, 2012). Bakery products usually high in carbohydrate, fat and calorie, but low in fiber content (Mishra and Chandra, 2012). Date is an important fruit tree for semi-arid and hot arid regions of the country and highly nutritious and favorite fruit throughout the country. Besides fresh consumption, several value-added products viz., dry dates (chuhara), soft date (pind khajoor), jam, syrup, chutney, beverages, pickle (Singh and Dhandar, 2007), Date fruits provide abundant quantities of sugar, iron, potassium, calcium and nicotinic acid and small amounts of protein, copper, magnesium, chlorine, sulphur and vitamins. The pulp of mature date fruits contains about 80% sugars on dry weight basis, which being easily digestive, provide a ready source of energy to the human body. Such fruits can provide

about 3,150 calories per kg. In Pakistan, date palm fruits are harvested from mid-June to August at doka or khalal stage (hard ripe yellow, red or dark red color) because of lack of early maturing varieties. Due to short shelf life, fresh fruits have to be utilized immediately after harvest. In our country, Kachchh region of Gujarat has maximum area under this crop (1668 ha) with annual production of 1,23,490 tons, where maximum fruits are harvested at doka stage (Muralidharan *et al.*, 2008). The flesh of a fully ripe date consists of two-third sugar and one-quarter water, the rest being mainly cellulose, pectin, vitamin and ash. The date considered as a nutritious fruit (Anwarul *et al.*, 2012).

### MATERIALS AND METHODS

The study was carried out to determine physico-chemical and organoleptic characteristics of biscuits enriched with date powder experiment was conducted at the laboratories of Institute of Food Science and Technology, Tando Jam Agriculture University Sindh, during 2018.

**Collection of samples:** Common dehydrated Aseel date variety were collected from the Khairpur market and brought to the laboratory of the Institute of Food Science and Technology, Sindh Agriculture University, Tandojam. Dehydrated dates were grinded in grinder machine packed and labeled and then stored at ambient tempera-

ture ( $30 \pm 4^\circ\text{C}$ ) until use.

#### Development of biscuits using date powder:

Three types of biscuits were prepared by using different ration of dehydrated dates powder. Type-I biscuit was prepared by using 0% dates powder, Type-II by 50% dates powder and Type-III by using 100 % dates powder. Other ingredients used and method of preparation of biscuit is depicted in Table 1-3

**Table 1: Ingredients used and method of preparation each product (T1)**

Egg	1	Sieve refined flour and date powder together. Butter, sugar and Milk powder Add sodium bicarbonate and salt. Add sieved flours and mix well. Knead a smooth dough keep for 30 min. Again, knead dough. Make biscuits and bake at $160^\circ\text{C}$ for 30 minutes.
Sugar	100 g	
Butter	133 g	
Vanilla powder	2 g	
Baking powder	1 ½	
Maida	200 g	
Milk powder	10 g	
Salt	3 g	

**Table 2: Ingredients used and method of preparation each product (T2)**

Egg	1	Sieve refined flour and date powder together. Butter, Date powder, sugar and Milk powder Add sodium bicarbonate and salt. Add sieved flours and mix well. Knead a smooth dough keep for 30 min. Again, knead dough. Make biscuits and bake at $160^\circ\text{C}$ for 30 minutes.
Sugar	50 g	
Date powder	50 g	
Butter	133 g	
Vanilla powder	2 g	
Baking powder	1 ½	
Maida	200 g	
Milk powder	10 g	
Salt	3 g	

**Table 3: Ingredients used and method of preparation ach product (T3)**

Egg	1	Sieve refined flour and date powder together. Butter, sugar and Milk powder Add sodium bicarbonate and salt. Add sieved flours and mix well. Knead a smooth dough keep for 30 min. Again, knead dough. Make biscuits and bake at $160^\circ\text{C}$ for 30 minutes.
Sugar	100 g	
Butter	133 g	
Vanilla powder	2 g	
Baking powder	1 ½	
Maida	200 g	
Milk powder	10 g	
Salt	3 g	

#### Preparation of samples for Physico-chemical and sensorial analysis:

The prepared biscuits were analyzed, such as moisture (%), ash (%), TSS, pH, protein (%), total carbohydrates (%), fat (%), crude fiber and titratable acidity (%) were determined using the official methods of AOAC (2000) and Vitamin C (ascorbic Acid) was James (1995) and Mazumdar and Majumder (2003). The prepared biscuits were coded and evaluated for sensorial analyses such as flavor, taste, texture, color consistency and overall acceptability.

**Statistical analysis:** The data was subjected to an analysis of variance (ANOVA) described by Steel *et al.*, (1996).

## RESULTS

The data on the above parameters are presented in (Tables 4-14) and analysis of variance as seen in Tables 4-14. Moisture 10.27, Protein 1.89, Fat 0.39, Fiber 9.83, Ash 0.04, pH 5.62, Total acidity 0.02, Vitamin C 0.02, Carbohydrate 5.75.

**Table 4: Composition of dehydrated dates powder (%)**

Parameters	RI	RII	RIII	Mean
Moisture	10.00	10.50	10.30	<b>10.27</b>
Protein	1.70	2.12	1.84	<b>1.89</b>
Fat	0.42	0.36	0.38	<b>0.39</b>
Fiber	9.60	10.10	9.80	<b>9.83</b>
Ash	0.044	0.033	0.040	<b>0.04</b>
pH	5.6 0	5.57	5.68	<b>5.62</b>
Total acidity	0.013	0.025	0.020	<b>0.02</b>
Vitamin C	0.012	0.022	0.017	<b>0.02</b>
Carbohydrate	5.50	6.00	5.75	<b>5.75</b>

**Moisture (%):** It is evident from the results that the maximum biscuits moisture (3.65%) when the biscuits treated with 100% dates powder, followed by 50% date powder with 2.92% moisture. However, the minimum moisture (2.44%) was observed with 0% without date powder (control). It was found that 100% dates powder was optimum level for biscuits so far the moisture (%). The LSD test demonstrated that the differences in moisture (%) different date powder levels were significant ( $P < 0.0$ ).

**Table 5: Effect of different ratio of date powders on moisture (%) of biscuits**

Treatments	RI	RII	RIII	Mean
T1	2.55	2.33	2.44	<b>2.44 C</b>
T2	2.84	3.00	2.92	<b>2.92 B</b>
T3	3.81	3.50	3.66	<b>3.65 A</b>

S.E.± 0.0972

LSD 0.05 0.2379

T1= 0% without date powder (control);

T2= 50% date powder

T3= 100% dates powder

**Ash (%):** It is evident from the results that the maximum biscuits ash (0.69%) when the biscuits treated with 100% dates powder, followed by 50% date powder with 0.36% ash. However, the minimum ash (0.30%) was observed with 0% without date powder (control). It was found that 0% without date powder (control) was optimum level for biscuits so far the ash (%). The LSD test demonstrated that the differences in ash (%) different date powder levels were significant ( $P < 0.05$ ).

**Table 6: Effect of different ratio of date powders on ash (%) of biscuits**

Treatments	RI	RII	RIII	Mean
T1	0.37	0.35	0.36	<b>0.30 C</b>
T2	0.29	0.32	0.30	<b>0.36 B</b>
T3	0.66	0.72	0.69	<b>0.69 A</b>

S.E.± 0.0166

LSD 0.05 0.0405

T1= 0% without date powder (control);

T2= 50% date powder

T3= 100% dates powder

**Total soluble solids (°Brix):** Results shows that the maximum biscuits total soluble solid (11.71° Brix) observed when the biscuits treated with 100 % dates powder, followed by 50% date powder with 9.72° Brix total soluble solid. However, the minimum total soluble solid (9.50°Brix) was observed with 0% without date powder (control). It was found that 0% without 100% dates powder was optimum level for biscuits so far the total soluble solid (°Brix). The LSD test demonstrated that the differences in total soluble solid (°Brix) different date powder levels were significant (P<0.05).

**Table 7: Effect of different ratio of date powders on Total soluble solids (°Brix) of biscuits**

Treatments	RI	RII	RIII	Mean
T1	9.49	9.51	9.50	<b>9.50 C</b>
T2	9.70	9.74	9.72	<b>9.72 B</b>
T3	1.70	11.73	11.71	<b>11.71 A</b>

S.E.± 0.0128

LSD 0.05 0.0312

T1= 0% without date powder (control);

T2= 50% date powder

T3= 100% dates powder

**pH value (%):** It is evident from the results that the maximum biscuits pH value (5.70) was observed when the biscuits treated with 100% dates powder, followed by 50% date powder with 5.63 pH value. However, the minimum pH value (5.60) was observed with 0% without date powder (control). It was found that 100% dates powder was optimum level for biscuits so far the pH value. The LSD test demonstrated that the differences in pH value different date powder levels were significant (P<0.05).

**Table 8: Effect of different ratio of date powders on pH of biscuits**

Treatments	RI	RII	RIII	Mean
T1	5.61	5.60	5.60	<b>5.60 C</b>
T2	5.62	5.64	5.63	<b>5.63 B</b>
T3	5.69	5.72	5.70	<b>5.70 A</b>

S.E.± 9.0273

LSD 0.05 0.0221

T1= 0% without date powder (control);

T2= 50% date powder

T3= 100% dates powder

**Vitamin C (mg/100g<sup>-1</sup>):** It is evident from the results that the maximum biscuits vitamin C (20.68 mg/100g<sup>-1</sup>) was noted when the biscuits treated with 100% dates powder, followed by 50% date powder with 20.68 mg/100g<sup>-1</sup> vitamin C. However, the minimum vitamin C (16.92 mg/100g<sup>-1</sup>) was observed with 0% without date powder (control). It was found that 100% dates powder was optimum level for biscuits so far the vitamin C. The LSD test demonstrated that the differences in vitamin C was noted in date powder levels which is non-significantly (P>0.05).

**Table 9: Effect of different ratio of date powders on vitamin C (mg/100g<sup>-1</sup>) of biscuits**

Treatments	RI	RII	RIII	Mean
T1	18.81	15.04	16.92	<b>16.92 C</b>
T2	17.80	19.00	20.22	<b>19.01 B</b>
T3	22.56	18.80	20.68	<b>20.68 A</b>

S.E.± 1.5364

LSD 0.05 3.7594

T2= 50% date powder

T3= 100% dates powder

**Fat %:** It is evident from the results table 10 that the maximum biscuits fat (34.19%) noted when the biscuits treated with 100% dates powder, followed by 50% date powder with 33.79% fat. However, the minimum fat (32.61%) was observed with 0% without date powder (control). It was found that 100% dates powder was optimum level for biscuits so far the fat. The LSD test demonstrated that the percentage of fat different in date powder levels were non-significantly (P>0.05).

**Table 10: Effect of different ratio of date powders on fat (%) of biscuits**

Treatments	RI	RII	RIII	Mean
T1	32.13	33.10	32.61	<b>32.61 A</b>
T2	32.85	34.74	33.79	<b>33.79 A</b>
T3	35.30	33.09	34.19	<b>34.19 A</b>

S.E.± 0.7225

LSD 0.05 1.7680

T1= 0% without date powder (control);

T2= 50% date powder

T3= 100% dates powder

**Crude fiber (100 mg<sup>-1</sup>):** It is evident from the results that the maximum biscuits crude fiber (0.04% 100 mg<sup>-1</sup>) noted when the biscuits treated with 100% dates powder, followed by 50% date powder with 0.03% 100 mg<sup>-1</sup> crude fiber. However, the minimum crude fiber (0.02 100 mg<sup>-1</sup>) was observed with 50% date powder. It was found

that 100% dates powder was optimum level for biscuits so far the crude fiber. The LSD test demonstrated that the differences in crude fiber different date powder levels were significantly ( $P < 0.05$ ).

**Table 11: Effect of different ratio of date powders on crude fiber ( $100 \text{ mg}^{-1}$ ) of biscuits**

Treatments	RI	RII	RIII	Mean
T1	0.015	0.020	0.017	<b>0.02 C</b>
T2	0.035	0.030	0.032	<b>0.03 B</b>
T3	0.040	0.045	0.042	<b>0.04 A</b>

S.E.± 3.84903

LSD 0.05 9.41803

T1= 0% without date powder (control);

T2= 50% date powder

T3= 100% dates powder

**Protein (%):** It is evident from the results (Table 11) that the maximum biscuits protein (7.65%) noted when the biscuits treated with 100% dates powder, followed by 50% date powder with 12.02 % protein. However, the minimum protein (18.59 %) was observed with 0% without date powder (control). It was found that 100% dates powder was optimum level for biscuits so far the protein. The LSD test demonstrated that the differences in protein different date powder levels were non-significantly ( $P > 0.05$ ).

**Table 12: Effect of different ratio of date powders on protein (%) of biscuits**

Treatments	RI	RII	RIII	Mean
T1	6.56	8.75	7.65	<b>7.65 C</b>
T2	13.12	10.93	12.02	<b>12.02 B</b>
T3	17.5	19.68	18.59	<b>18.59 A</b>

S.E.± 3.2598

LSD0,05 7.9765

T1= 0% without date powder (control);

T2= 50% date powder; T3= 100% dates powder

**Carbohydrate:** It is evident from the results that the maximum biscuits carbohydrate (54.18%) was observed when the biscuits treated with 100% dates powder, followed by 50% date powder with 52.11% carbohydrate. However, the minimum carbohydrate (44.37%) was observed with 0% without date powder (control). It was found that 100% dates powder was optimum level for biscuits so far the carbohydrate. The LSD test demonstrated that the differences in carbohydrate different date powder levels were non-significantly ( $P > 0.05$ ).

**Table 13: Effect of different ratio of date powders on carbohydrate (%) of biscuits**

Treatments	RI	RII	RIII	Mean
T1	56.10	52.27	54.19	<b>54.18A</b>

T2	51.59	52.62	52.12	<b>52.11A</b>
T3	44.24	44.51	44.38	<b>44.37B</b>

S.E.± 1.0673

LSD0.05 2.9633

T1= 0% without date powder; (control)

T2= 50% date powder; T3= 100% dates powder

**Overall acceptability:** Overall acceptability results shows that the maximum score of overall acceptability was noted (8.06) when the biscuits treated with 100% dates powder, followed by 50% date powder with 7.56 overall acceptability. However, the minimum overall acceptability (6.60) was observed with 0% without date powder (control). It was found that 100% dates powder was optimum level for biscuits so far the overall acceptability. The LSD test demonstrated that the differences in overall acceptability different date powder levels were non-significantly ( $P > 0.05$ ).

**Table 14: Effect of different ratio of date powders on overall acceptability of biscuits**

Treatments	RI	RII	RIII	Mean
T1	6.8	6.6	6.4	<b>6.60 C</b>
T2	7.6	7.3	7.8	<b>7.56 B</b>
T3	8.0	7.9	8.3	<b>8.06 A</b>

S.E.± 0.1816

LSD 0.05 0.5041

T1= 0% without date powder (control);

T2= 50% date powder

T3= 100% dates powder

## DISCUSSION

Biscuits have always been one of the most popular food items due to their taste, textural characteristics, compactness, convenience and cost competitiveness, and have lower moisture content from cakes and bread, and generally safer from microbiological spoilage and have a longer shelf life (Singh and Dhandar, 2007).

The biscuits treated with 100% dates powder resulted 3.65% moisture, 0.69% ash, 11.71°Brix total soluble solids, 5.70 pH value, 20.68 mg/100g vitamin C, 34.19% fat, 0.04 per 100 mg crude fiber, 7.65% protein, 54.18% carbohydrate, 8.36 color, 8.60 flavor, 7.86 texture, 8.50 taste and 8.06 overall acceptability. Similarly, the biscuits with 50% date powder resulted 2.92% moisture, 0.36% ash, 9.72°Brix total soluble solids, 5.63 pH value, 20.68 mg/100g vitamin c, 33.79% fat, 0.03 per 100 mg crude fiber, 12.02% protein, 52.11% carbohydrate, 7.46 color, 7.53 flavor, 7.60 texture, 7.46 taste and 7.56 overall acceptability. The date powder 0% without date powder (control) resulted in 2.44% moisture, 0.30% ash, 9.50°Brix total soluble solids, 5.60 pH value, 16.92 mg/100g vitamin C,

32.61% fat, 0.02 per 100 mg crude fiber, 18.59% protein, 44.37% carbohydrate, 6.26 color, 6.63 flavor, 6.56 texture, 6.46 taste and 6.60 which is overall acceptability. It is concluded from the study that the biscuits treated with Treatment-3 100% date powder shown better effect on quality of biscuits, and physico-chemical parameters. It is also concluded that date powder enriched biscuits are safe than sucrose added biscuits for diabetes people. The results were in accordance with Fahloul *et al.*, (2010) who mentioned that by increasing of date powder levels the biscuit hardness values was decreased. Khouryieh and Aramouni (2012) mentioned that the biscuit hardness is related to the development of gluten and the interaction with flour ingredients in the formula is acceptable at 30% mixture. The appearance, taste and flavor of biscuits under T1 and T2 were good even after 30 days of storage. The acceptability of biscuits gradually decreased with increasing period of storage because of taste sensation after one month period. This may be possibly due to the chemical reactions in carbohydrates and fats of the products. During storage, changes in physico-chemical characters are common in any value added product. The finding is similar with the results reported by Singh and Dhandar (2007).

#### Conclusion

- It is concluded from the study that the biscuits treated with T3 100% date powder shown better effect on quality of biscuits, and physico-chemical parameters.
- It is also concluded that date powder enriched biscuits are safe than sucrose added biscuits for diabetes people.

#### Suggestions

- It is suggested that biscuits enriched with date powder are nutritious for better health, good in taste and less sweetener than common sugar biscuits
- It is suggested from this study that replacement of date powder enriched biscuits can be recommended for patients of diabetes in order to decrease the intake of common table sugar.

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