

Production of a New Drink by Using Date Syrup and Milk

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ABSTRACT: Date Syrup is a natural sweetener that is a suitable ingredient to be used in formulation of food products in order to improve the nutrient properties. In this research a new drink is produced by the addition of date syrup in concentration of 5%, 8%, and 10% to milk. Physical, chemical, rheological and sensory properties of the samples were evaluated. Statistical analysis using SPSS software and Duncan test at 95% confidence level were employed. It was concluded that with increasing the amount of date syrup in the formulation of drink, characteristics such as dry matter, specific gravity, turbidity, were increased. Color measurement of the samples reported that the color parameters, L*, a* and b*, of the samples have a significant difference and using date syrup in formulation of drink caused changes in the color of the samples. Sensory evaluation of the samples also indicated that by increasing the amount of date syrup the acceptability of the samples was increased and the highest score belonged to the sample including %10 date syrup.

Keywords: *Date Syrup, Drink, Milk, Natural Sweetener, Nutrient Properties.*

Introduction

Children are drinking less milk and one of the main reasons for this is the increasing consumption of soft drinks. Nevertheless, milk is an important part of a healthy diet for children due to its nutritional composition. Flavored milk represents a nutritious alternative to plain milk that can help to increase dairy consumption by the children (De Pelsmaeker *et al.*, 2013). Dates (*Phoenix dactylifera* L.) are significant products in hot desert regions of the world and are marketed as high-value fruit (FAOSTAT, 2006). Iran produces 18 percent of global date production and is a major date producing country (Jamshidi *et al.*, 2003). Dates are served as a source of calories with about 78% carbohydrates, 2-3% proteins and 1% fat (Nasehi *et al.*, 2012). Date consumption is an important source of

supplying vitamin and mineral in a balanced nutrition regime (Al-Shahib and Marshall, 2003). Date has antitumor activity, antioxidant and anti-mutagenic properties (Abbes *et al.*, 2013). Some studies have been carried out to use low quality dates to develop new products. The low quality date is a rich source of carbohydrates composed mainly of sugars and dietary fibers. Good quality date is employed in some products such as bakery, drink, jam and confectionery (Gad *et al.*, 2010). Research has shown that when dates are eaten alone or mixed with plain yoghurt have low glycemic indexes (Abbes *et al.*, 2013). Larger parts of the carbohydrates in dates are in the form of fructose and glucose (Ishurd and Kennedy, 2005). Polysaccharide isolated from dates has an antitumor activity (Mohamed and Ahmed, 1981). High fructose syrup and liquid sugar can be produced from date syrup (Ishurd and Kennedy, 2005). Date

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syrup is a product obtained from matured product with about 67-72% solid concentration consisting of 95% reducing sugar (Mohamed and Ahmed, 1981; Rofehgari-Nejad *et al.*, 2010). Date syrup is a high energy food rich in carbohydrate, a good source of minerals; but it also contains a very complex mixture of other saccharides, amino and organic acids, polyphenols and carotenoids (Abbes *et al.*, 2013). The ingredients of date syrup depend on the type of date, but generally date syrup contains fructose, glucose, moisture and small amount of sucrose, protein, pectin, and calcium (Khosravanipour, 2011). Date syrup is used in the preparation of some traditional and industrial foods (Mohamed and Ahmed, 1981; Rofehgari-Nejad *et al.*, 2010). The Date syrup is directly consumed or used as an ingredient in some food formulation such as ice cream products, drink, confectionery, bakery products, sesame paste/date syrup blends, jam and some other (Barrevel, 1983). Some Studied have been done on using of date syrup as a flavor in dairy products. The result of these studies have shown that low-fat cow milk prepared with palm syrup and fermented products prepared from milk being flavored with date syrup, led to good outcomes (Moneib *et al.*, 1999). The purpose of this study is the use of date syrup as a suitable ingredient to improve the sensory characteristic and nutritional value of the drink that might be consumed as a new functional drink.

Materials and Methods

This study was designed to use the date syrup in formulation of new functional drink. The date syrup was provided from Sybasan Company of Borujen.

- Functional Drink Production

Preparation of the samples was performed by the addition of 5, 8, and 10 percent of the date syrup to the milk. After mixing the samples were pasteurized in water bath (Memmert Model WNB-10, made in

Germany) and the samples were packed in 200ml bottles and were kept in the refrigerator.

- The physical and chemical characteristics

To evaluate the impact of date syrup addition in new drink, physical, chemical and rheological properties were compared. Density measurement of the samples was by pycnometer 50 ml. Measurement of dry matter was conducted according to the national standard number using oven (Memmert Model UFE500 Germany). pH measurement was conducted by pH meter (Jenway Model 3510 - England), ash measurement was conducted by heating the samples in porcelain crucibles in a furnace at the temperature of 500 °C for 6-8 hours. Turbidity measurement was conducted by turbidity meter (Microprocessor turbidity Model Meter-HI 93703) and the resulting turbidity was calculated in NTU.

- The rheological behavior

Evaluation of the rheological properties of the date syrup was carried out by Brookfield rheometer model RV-DV III and the finished samples treatments was carried out by Brookfield rheometer model LV-DV III and water bath model TC-502 at 5 ° C. Rheological behavior of all the samples was fitted with the power law models.

- Colour measurements

A tristimulus reflectance colorimeter (Hunter Lab, model D25, Hunter Associates Laboratory, Inc Reston, VA) was used for determination of color of the samples. Tripartite measurements of L*, a*, and b* were recorded for each sample. The L* parameter (lightness index scale) ranges from 0 (black) to 100(white). The a* parameter indicates the degree of red (+a*) or green (-a*) color and the b* parameter measures the degree of yellow (+b*) or blue (-b*) color.

- Sensory analysis

Drink samples were examined for sensory preference test in a hedonic scale of 9 points, where 1 (one) was for dislike very much and 9 (nine) for like very much. The evaluators were asked to drink water after eating any of the previous samples to omit the effect of their previous evaluations.

- *Statistical analysis*

The results of this study were analyzed using SPSS statistical software. Data analysis method used for analysis of variance (ANOVA) and Duncan's post hoc test ($P < 0.05$) and the SPSS software version 16 were employed for drawing the graphs.

Results and Discussion

- *Characteristics of Date Syrup*

The physical and chemical characteristics of the date syrup were studied. Results are shown in Table 1. According to this table the major part of date syrup consisted of reducing sugar and sucrose. Fructose and glucose are the predominant sugars. These sugars have more advantages in comparison with sucrose on health since they are natural and have higher sweetness (Ghafari *et al.*, 2013).

Table 1. Properties of date syrup

| Properties | amount |
|------------------|--------|
| Dry matter (%) | 72.1 |
| Ash (%) | 1.69 |
| Specific gravity | 1.36 |
| pH | 4.20 |
| Total sugar | 70.27 |
| Reducing sugar | 67.97 |
| Sucrose | 2.18 |

Rheological analysis of date syrup indicates the shear thinning behavior and the flow index that is less than one. Rheological properties of date syrup were investigated at various temperature, concentration and shear rate by Gabis, 2013 and the result of Gabis's study indicated that a shear thinning behavior was observed for all the concentrations, $n < 1$ (Gabsi *et al.*, 2013).

- *Physical and chemical characteristics of treated drinks*

Physical and chemical properties of the samples of drinks are shown in Table 2 that indicate the dry matter is increased by increasing date syrup percentage in the product. By increasing the date syrup concentration in the formulation, the turbidity and specific gravity is increased. Since the date syrup pH is lower than milk, the final pH of the drinks is decreased.

- *The effect of date syrup on the color of sample of drink*

L^* (whiteness/darkness ranged from 0 to 100), a^* (a^* redness for positive value and greenness for negative one), and b^* (b^* yellowness for positive & blueness for negative value) of the samples are shown in Table 3. The color parameters, L^* , a^* and b^* , of the samples have significant differences and using date syrup in the formulation of drink caused changes in the color of the samples. Results revealed that L^* factor would decrease but a^* and b^* factors would decrease by the addition of date syrup to the formulation, since the highest amount of L^* factor was related to the control sample and the lowest amount of this factors was concerned with the sample containing %10 date syrup. Study of the date syrup colorants showed that Melanoidin is the major part of colorant of date juice originating from the maillard reactions between amino acids and the reducing sugars. Another study indicated that alkaline degradation products of hexoses and iron-polyphenol complexes are other colorants (Rofehgari-Nejad *et al.*, 2010).

- *Rheological behaviors of drink treatments*

The results showed that by increasing the amount of date syrup in the formulation of the drink, the consistency index is increased. According to Table 4 the rheological behavior of the samples by addition of date

syrup to the formulation has changed since a Newtonian fluid is converted to the Pseudo plastic fluid. The flow index decreased by increasing the amount of date syrup. The flow behavior index values have changed from 0.97 for the sample containing %10 date syrup to 1 for the control sample.

- *Sensory evaluation*

Sensory evaluation of the drink samples was investigated to study the effect of date syrup addition on overall acceptability of consumers. Among the samples the one

containing date syrup, the highest score belonged to the sample with %10 date syrup and by increasing the concentration of date syrup the acceptability of the samples was increased. Evaluation of the nutritional value of the functional yogurt resulting from the combination of date palm syrup and skim milk were also studied and the results showed that date palm syrup provides unique functionally when used with milk in the processing of yogurt (Gad *et al.*, 2010).

Table 2. Physical and chemical properties of the drinks

| | Control sample | Sample containing %5 date syrup | Sample containing %8 date syrup | Sample containing %10 date syrup |
|------------------|-----------------------------------|---------------------------------|---------------------------------|----------------------------------|
| Dry matter (%) | 12.04 ^a ± 0.18 | 15.07 ^b ± 0.15 | 16.78 ^c ± 0.11 | 18.09 ^d ± 0.12 |
| Turbidity (NTU) | 106 ^a ± 1 ^a | 0.57 ^b ± 134.3 | 152.6 ^c ± 0.57 | 174.3 ^d ± 1.15 |
| Specific gravity | 1.030 ^a ± 0.001 | 1.031 ^b ± 0.002 | 1.034 ^c ± 0.001 | 1.035 ^c ± 0.001 |
| pH | 6.64 ^a ± 0.05 | 6.55 ^b ± 0.01 | 6.51 ^b ± 0.004 | 6.5 ^b ± 0.01 |

Mean values ± SD of triplicate determinations.

Table 3. Characteristics of the samples color

| sample | L | a | b |
|----------------------------------|---------------------------|---------------------------|---------------------------|
| Control sample | 88.61 ^a ± 0.39 | -3.22 ^a ± 0.03 | 12.04 ^a ± 0.18 |
| Sample containing %5 date syrup | 75.31 ^b ± 0.03 | -2.14 ^b ± 0.01 | 8.67 ^b ± 0.11 |
| Sample containing %8 date syrup | 65.22 ^c ± 0.36 | -1.95 ^c ± 0.02 | 9.75 ^c ± 0.01 |
| Sample containing %10 date syrup | 60.13 ^d ± 0.11 | -1.13 ^d ± 0.01 | 10.13 ^d ± 0.01 |

Table 4. Power-law parameters for drink at different concentrations of date syrup

| Sample | k | n | R ² |
|----------------------------------|------|------|----------------|
| Control sample | 4.54 | 1 | 99.5 |
| Sample containing %5 date syrup | 4.59 | 1 | 99.1 |
| Sample containing %8 date syrup | 4.80 | 0.99 | 99.5 |
| Sample containing %10 date syrup | 4.97 | 0.97 | 99.6 |

Table 5. Sensory evaluation of drink samples

| Drink sample | Score |
|--------------------------------------|--------------------------|
| Control sample | 1.6 ^b ± 0.69 |
| The sample containing %5 date syrup | 2.42 ^a ± 0.84 |
| The sample containing %8 date syrup | 3.8 ^c ± 0.78 |
| The sample containing %10 date syrup | 4 ^c ± 0.81 |

*Different letters indicated the significant difference (p<0/05).

Conclusion

Adding date syrup in the formulation of drink samples caused changes in physical and chemical properties. Dry matter was increased with the increase of date syrup. Since the date syrup has a nutritional value, using it in the formulation of orange drink made an enriched drink. Rheological behavior of the samples by the addition of date syrup in the formulation has changed from a Newtonian fluid to a non-Newtonian one. According to the nutritional characteristics of the date syrup and the good flavor of this product and increasing the acceptability of the samples this formulation is regarded as a new functional drink.

References

- Abbes, F., Kchaou, W., Blecker, C., Ongena, M., Lognay, G., Attia, H. & Besbes, S. (2013). Effect of processing conditions on phenolic compounds & antioxidant properties of date syrup". *Industrial crop & product*.44, 634-642.
- Al-Shahib, W. & Marshall, R. J. (2003). The fruit of the date: it's possible as the best food for the future", *International Journal of Nutrient*, 54, 247-259.
- Barreveld, W. H. (1993). Date palm products. *Nume'ro Agricole 101 de bulletin de services de la FAO*.
- De Pelsmaeker, S., Schouteten, J., & Gellynck, X. (2013). The consumption of flavored milk among a children population. The influence of beliefs & association of br & with emotions, *Appetite* 71,279-286.
- FAOSTAT. (2006). *Bases de Donne's statistics de la FAO*. Rome: Food & Agriculture Organization of the united Nation.
- Gabsi, K., Trigui, M., Barrington, S., Nouredine Helal, A. & Taherian, A. L. (2013). Evaluation of rheological properties of date syrup. *Journal of food engineering*. 117, 162-172.
- Gad, A. S., Kholif, A. M. & Sayed, A. F. (2010). Evaluation of the nutritional value of functional yogurt resulting from combination of date palm syrup & skim milk. *American Journal of Food Technology*, 5, 250-259.
- Ghafari, Z., Hojjatoleslamy, M., Shokrani, R. & Shariaty, M. A. (2013). Use of date syrup as a sweetener in nonalcoholic beer: sensory & rheological assessment. *International peer-reviewed scientific online journal*.3, 182-184,
- Ishurd, O. & Kennedy, J. F. (2005). The anticancer activity of polysaccharide prepared from Libyan dates (*Phoenix dactylifera L.*). *Carbohydrate. Polymer*, 59, 531-535.
- Jamshidi, M., Mokhber, M., Alemzadeh, I. & Vossoughi, M. (2003). Optization of hfds production from date syrup, *International Journal of Engineering*. 21, 127-133.
- Khosravanipour Mostafazadeh, A., Sarshar, M., Javadian, Sh., Zarefard, M. R. & Amirifard Haghighi, Z. (2011). Separation of fructose & glucose form date syrup using resin chromatographic method: Experimental data & mathematical modeling, *Separation & purification technology*, 79, 72-78.
- Mohamed, M. A. & Ahmed, A. A. (1981). Libyan date syrup (Rub-AL-Tamr), *Journal of food science*. 46: 1162-1166.
- Moneib, A., EL-Sadak, G. M. & Farag, A. H. (1999). Sterilized Flavored milk drinks: Date-flavored buffalo skim milk".*egyptian journal of dairy science*, 2, 105-120.
- Moskowitz, H. R. (1983). *Product testing & sensory evaluation of foods: marketing & R&D approaches*. Westport, CT: Food & Nutrition Press.
- Nasehi, S. M., Ansari, S. & Sarshar, M. (2012). Removal of dark colored compounds from date syrup using activated carbon: A kinetic study. *Journal of Food Engineering*, 111, 490-495.
- Rofehgari-Nejad, L., Pirrzifard, M., Asefi, N., Tabibi-Azar, M. & Ashrafi, R. (2010). Comparative study of date syrup

decolourization efficiency with ion exchange resins & bone chart, Asian Journal of Chemistry, 22, 16-20.

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