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Effect of incorporation of Date palm paste in shrikhand: Physical, chemical and sensory properties of shrikhand

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Abstract

Shrikhand is a semi-soft, sweetish-sour fermented dairy product prepared from lactic fermented curd. Shrikhand is very popular in Gujarat, Maharashtra and Karnataka. Shrikhand has been recommended for those patients which suffering from obesity and cardiovascular disease due to its low fat and sugar contents.The curd is partially strained through a muslin cloth to remove the whey and thus produce a solid mass known as chakka. Chakka is mixed with required amounts of sugar, color, flavour etc. to yield Shrikhand.Date palm is most important arboricultural crops in the world. Date is cultivated in both dry and semi –arid area. Date palm has been cultivated for its medicinal properties such as antimutagenic, immunostimulant and gonadotropic activities and also for its edible sweet fruit, energy boosters and hunger pacifiers. Date palm also contain calcium, cobalt, copper, fluorine, iron, magnesium, potassium, zinc, sodium and phosphorous.The effect of date paste on the physiochemical properties and organoleptic of shrikhand were analysed. T_1, T_2, and T_3 were prepared by different concentration of date palm paste with one control. Date palm was found to contain higher TSS, mineral and fiber content. It was found that increase in concentration of date palm paste in shrikhand decrease setting time. With respect to synersis of shrikhand, synersis decrease with increasing concentration of paste. The acidity, moisture and total soluble solid were found to increase with increasing concentration of date palm paste in case of sample. Organoleptic evaluation with color, appearance, flavour, taste and overall acceptability showed highly significant effect due to addition of date paste.

Introduction

Shrikhand is a semi-soft, sweetish-sour fermented dairy product prepared from lactic fermented curd (Singh et al., 2014). Lactic fermented curd is produced by the action of microorganisms on the milk constituents. The curd is partially strained through a muslin cloth to remove the whey and thus produce a solid mass known as chakka. Chakka is mixed with required amounts of sugar, color, flavour etc. to yield Shrikhand (De, 1980). The name shrikhand is derived from the Sanskrit word “Shikharani” (Swapna and Chavannavar, 2013) meaning good nourishing food having high protein and calorific value.Shrikhand is very popular in Gujarat, Maharashtra and Karnataka. Shrikhand has been recommended for those patients which suffering from obesity and cardiovascular disease due to its low fat and sugar contents (Swapna and Chavannavar 2013).

Shrikhand contain moisture 39.0% and 61.0% of total solids of which 10.0% is fat, protein 11.5%, carbohydrates 78.0% and ash 0.5%, on a dry matter basis with a pH of about 4.2-4.4 (Boghra and Mathur, 2000), it also contain B- complex vitamins, particularly riboflavin and folic acid.

Shrikhand possess antibacterial properties against pathogens as well as spoilage organisms (Desai et al., 1987 and Sarkar et al., 1996)

Date palm (*Phoenix dactylifera L.*)is most important arboricultural crops in the world. Date is cultivated in both dry and semi –arid area. Date palm has been cultivated for its medicinal properties such as antimutagenic ,immunostimulant and gonadotropic activities and also for its edible sweet fruit, energy boosters and hunger pacifiers. Date fruit contain carbohydrates (73-79%), total dietary fibers (14-18%), ash (2.5%), protein (2.1-3.0 %) (Elleuch et al., 2008), and fat (2.0-3.2%) (AlFarsi et al., 2007), moisture (8.64 - 10.64%) (Abdillah and Andriani, 2012; Abdul Afiq et al., 2013).Date palm also contain calcium, cobalt, copper, fluorine, iron, magnesium, potassium, zinc, sodium and phosphorous (Ahmed et al.,1995) The date are

producing in many country such as Egypt, Iran, Saudi Arabia, United Arab Emirates (U.A.E), Pakistan, Algeria, Sudan, Iraq, Oman and Libya etc. They produce approximately 91% of the world's dates.

MATERIAL AND METHOD

Raw Material

Double tonned milk of vita brand was taken, other ingredients such as sugar, fruit (date plam) were procured from local market of Sirsa.

Method

Preparation of Shrikhand

1lt of milk was used to prepare shrikhand, double tonned milk with 1.5% fat was boiled to 95ºC for 10 min, and then boiled milk was cooled to 35ºC for the preparation of curd. Curd was allowed to develop 0.8 to 1% acidity due to lactic acid; it is then emptied in muslin cloth and then hangs for 2-4 hr. for complete drainage of whey and to obtain shrikhand. Approximately around 200 to 227 gm of chakka was obtained from 1 lt of milk.

Composition of chakka depends upon the initial composition of milk, the degree of fermentation (i.e. acidity developed) and the extent of whey removed. Date palm was firstly blended alone and then along with chakka, after that sugar is added. Level of date palm and sugar is according to 25:50%, 50:25% and 50:50% in three samples of shrikhand, respectively according to the weight of chakka. All the three ingredients were properly mixed till a homogenized mixture was obtained.

Analysis of Shrikhand

Physical properties of fortified shrikhand

Setting time: The setting time of sample was recorded from the time of inoculation to just coagulum was formed and it was recorded in hours.

Determination of synersis: A sample of 100g centrifuged at 25ºC and whey was drained for 2-5 hr. The weight of draied whey reported as the percentage of synersis.

Proximate Analysis

The shrikhand prepared from different levels of paste was analysed for physio-chemical characteristics such as pH, moisture, protein and fat, total soluble solids and acidity has been determined as the procedure discussed.

Determination of Acidity Analysis:

Food acidity is the important parameter in foods besides affecting flavor. Food acidity affects the ability of microorganisms to grow in the food. Microorganisms prefer minimal acidity and are prevented from growing when acid level gets high enough. Titrable acidity of a solution is an approximate of solutions total acidity. The titrable acidity of a solution is measured by reacting acid present with the base such as a sodium hydroxide to a chosen end point; lose to neutrality as indicated by an acid sensitive colour.

About 5g of crushed rice chips sample into a beaker and add 100ml of distilled water to it. Put few drops of 1%phenolphthalein to it as indicator. Then titrate the solution with 0.05N NaOH, Change in color (pink color) indicates at the end point. Note the titrated value and Cary out a blank determination using water only (AOAC, 2000).

Calculations:

$$\text{Acidity \%} = \frac{(\text{titer value})\ (\text{normality of NaOH})\ (\text{factor})}{\text{Weight of the sample taken}}$$

Sensory Evaluation of Shrikhand:

Sensory evaluation of shrikhand, obtained by adding date palm was done with the help of 9 point hedonic scale. The extent of the acceptability of the product judged by organoleptic evaluation on a point hedonic rating scale.

Statistical analysis

The data shown in all the tables are an average of triplicate observations and were subjected to one way analysis of variance (ANOVA) using Minitab statistical software version 14 (Minitab Inc, USA).

Result

Proximate composition of chakka

Chakka is the major component of shrikhand. Composition of chakka depends upon initial composition of milk, the degree of fermentation, and the extent of whey removed. Table 1 depicts the composition of chakka which is obtained for the preparation of shrikhand. Due to removal of whey solid content increases and as a result of which moisture content decreases. The acidity of chakka was observed 2.35% in reference of lactic acid. The acidity increases due to increase in lactic acid content, pH is inversely proportional to acidity. Increase in acidity results in decrease in pH. The pH of chakka was 3.93. Ash content of chakka was observed 0.74%.

Table 1. Proximate composition of Chakka

Parameters	Values
Moisture	49%
Total soluble solids	51%
Total acidity	2.35%
pH	3.93
Ash	0.74%

Physical properties of date paste fortified shrikhand

Setting time: Date palm used in different concentration has significant effect on setting time of fortified shrikhand. Setting time of shrikhand reduced with increased in the concentration of fortification.

The minimum setting time was observed in sample T_3 (4.5 hr.) among all samples while setting time was reported in control sample (8hr.). Reduction of setting time of fortified shrikhand of present investigation is due to increase in concentration of date palm paste. Hence it is clear from the above discussion that setting time is inversely related to levels of date paste incorporation. Londsted 1974 and Rao et al., 1982 reported that the coagulation time of 5-6 hr. with different culture combination, the present results are in close conformation with these findings.

Synersis: The data in table 2, showed that the yield of synersis influenced significantly by increase in acidity of product.

Table 2: Effect of varying concentration of the date paste on settling time and synersis of shrikhand

Treatments	Settling time (h)	Synersis (%)
Control(40% sugar and without date palm)	8.0	20.0
T_1 (25% date palm and 50% sugar)	7.5	28.3
T_2 (50% date paste and 25% sugar)	5.5	23.7
T_3 (50% date paste and 50% sugar)	4.5	21.9

The sample T_1 having 25% date palm paste had significantly higher synersis due to higher acidity resulting in separation of whey and total solids. The minimum synersis was found in T_2 and T_3 having 50% date palm paste.

Table 3: Chemical composition of Date Palm Paste Fortified Shrikhand:

Treatments (Shrikhand)	pH	Acidity (%)	Moisture (%)	Fat (%)	Protein (%)	TSS (%)
Control	4.40	1.01	83.99	4.20	3.27	14.38
T_1	4.35	0.81	68.87	4.57	3.31	26.13

T_2	4.51	0.89	75.73	4.68	3.40	28.30
T_3	4.58	0.92	75.91	4.92	3.87	29.09

TSS= Total soluble solid

The pH values of control, T_1, T_2 and T_3 varied from 4.35-4.58. The pH content of T_3 (4.58) was observed maximum as compared to control, T_1 and T_2. Minimum pH was observed in T_1 (4.35) with 25% paste of date palm. The acidity of fortified shrikhand was affected significantly due to the addition of date palm paste. The acidity of fortified shrikhand was found to increase with increase in concentration of date palm. O'Neil et al., 1997, observed an increase in acidity with increase in concentration.

The T_3 has maximum moisture (75.91%) treated followed by T_2 (77.08). T_1 showed minimum moisture content among the sample of fortified shrikhand. The effect of sugar level on fat content was also significant. The interaction effect of pulp and sugar levels on fat was also significant. The fat content of shrikhand fortified with date palm paste and having significant proportion of sugar had fat content as; T_3 has higher fat content (4.92%) then T_2 and T_1 (4.61 and 4.51% respectively). The protein content of date palm fruit is in range of 2.19-2.93%. Protein content of date fortified shrikhand was observed higher in T_3. Total solid content in shrikhand ranged from 14.38-29.09%. The total soluble solid was found to be increased with increase in concentration of date palm paste.

Table 4: Sensory Evaluation of Shrikhand Fortified with Date Palm Paste added after Fermentation:

Treatments	Appearance	Color	Flavor	Taste	Texture	Overall acceptability
Control	7.3	7.1	7.2	7.6	7.4	7.5
T_1	7.3	7.2	7.4	7.8	8.1	7.9
T_2	7.6	7.8	8.2	8.6	8.4	8.2
T_3	6.7	7.1	7.2	7.3	7.4	7.3

Appearance: The T_1 containing 25% of date palm which was similar in appearance as that of control sample. It was learned that at lower concentration, date palm paste improved the appearance property, however further increase in concentration resulted in decreased appearance of product (due to reduction in water holding capacity of curd mass as it affect the protein interaction during coagulation process, resulting into more yield of synersis.

Color: The difference in color of the fortified shrikhand at lower concentration was highly significant due to addition of different concentration date palm paste. Among the all sample, the shrikhand having T_2 with 50% concentration of paste was scored for color i.e. 7.8. Control was not superior to other fortified shrikhand. It means that as compared to control, color was improved due to addition of date palm paste. However, further increase in concentration beyond 50% resulted in decrease in color acceptability even if the intensity of color was increased. It could be concluded from color observation that consumer prefers light coloredshrikhand whereas darkly coloredshrikhand reduces acceptability.

Flavor: Flavor of fortified shrikhand was significantly influenced by date paste incorporation. For flavor, the sample containing 50:25 ratio of date palm paste and sugar found to be superior amongst all other samples. Further increase in concentration reduced flavour acceptability (due to further increase in concentration resulted in increasing the alcoholic aroma and acidic taste of shrikhand. So, the minimum concentration should be preferred for the maximum flavour score.

Taste: The taste of fortified shrikhand was influenced significantly due to addition of date paste. From the table, it was observed that T_2 with 50% paste of date palm was scored maximum in taste. As compared to T_1 and T_3, the taste of the T_2 was liked extremely to the judging panels. As it is a natural sweetener, it enhanced the taste of shrikhand. Fortified T_2 was superior to control sample. It means that as compared to plain shrikhand, taste was improved due to addition of date paste prior to fermentation of milk.

Texture: The texture of fortified shrikhand was affected significantly due to addition of different concentration and variety date palm paste. It is revealed that higher concentration of fruit paste and sugar can reduce the score for texture. Texture was generally affected due to separation of whey at high level of paste and sugar due to production of acids, to give the reduced coagulation and formation of soft and loose textured curd. The score of fortified shrikhand was good as compared to control sample. With respect to the highest score of 8.2 was obtained to T_2 followed by T_1 (8.0) and T_3 (7.5).

Conclusion

The effect of date paste on the physiochemical properties and organoleptic of shrikhand were analysed. T_1, T_2, and T_3 were prepared by different concentration of date palm paste with one control. Date palm was found to contain higher TSS, mineral and fiber content. It was found that increase in concentration of date palm paste in shrikhand decrease setting time. With respect to synersis of shrikhand, synersis decrease with increasing concentration of paste. The acidity, moisture and total soluble solids were found to increase with increasing concentration of date palm paste in case of sample. Organoleptic evaluation with color, appearance, flavour, taste and overall acceptability showed highly significant effect due to addition of date paste. Shrikhand containing 50% date paste and 25% sugar powder found to be superior compared to control in case of other treatments. It is concluded that the use of date paste improved the qualities of double tonned milk shrikhand at lower concentration up to 25% of date paste in shrikhand improves the organoleptic as well and physic-chemical properties of shrikhand. Shrikhand having 50% date palm paste with 25% sugar showed the higher score (8.2) for sensory parameters like texture, color, flavour, taste and overall acceptability. Whereas the shrikhand having 50% date palm paste. With 50% sugar showed the lowest score (7.3) for all sensory parameters. Thus in terms of sensorial scores the quality of shrikhand was decreased as the level of date palm, because of its medical and nutrition value can be used for making quality shrikhand. These formulations can be easily adopted by the dairy industries, to prepare value added health foods required by a particular segment of population who are health conscious and consider food as medicine.

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