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Effect of Prebiotics on Physico-chemical and Sensory Properties of Synbiotic Shrikhand Blended with Papaya Pulp

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ABSTRACT

Background: Shrikhand is a semi solid, sweetish-sour, whole milk product, prepared from lactic fermented curd. The curd (dahi) is partially strained through a muslin cloth to remove the whey to yield Chakka. Sugar, flavour, colour and dry fruits/condiments are mixed into chakka to form a soft homogenous mass known as Shrikhand. It is a nutritionally dense fermented milk product. Its nutritional and therapeutic value can further be enhanced by incorporating fruit pulp or probiotics.

Method: The present study was undertaken for combination of different levels of dextrin as prebiotics (1.5, 2.0 and 2.5%), @ 1.5% probiotic culture *i.e*., *Lactobacillus casei* and 60% sugar, blended with different levels of papaya pulp (10, 20 and 30%) respectively for preparation of synbiotic shrikhand.

Result: The most acceptable quality of synbiotic shrikhand can be manufactured by using 2.0 per cent dextrine and 20 per cent papaya pulp which contained on an average 52.848, 8.3, 6.118, 38.492, 1.34 and 1.339 per cent total solids, fat, protein, total sugar, ash and titratable acidity, respectively and also observed significant effect in all the treatments were found subject to chemical analysis. Sensory attributes *viz*., colour and appearance, Flavour, body and texture and over all acceptability were judged by using 9-point hedonic scale of semi trained panelist and observed that the treatment (D_2P_2) with 2.0 per cent prebiotic and 20 per cent papaya pulp found highest sensory score.

Key words: Dextrine, Papaya, Prebiotics, Synbiotics.

INTRODUCTION

Milk and milk products like curd, buttermilk lassi and Shrikhand is inseparable dish in a regular diet of Indians. As per Sameem *et al*. (2018), Shrikhand is a very popular and delicious fermented milk product liked by many Indian's and is consumed regularly during various occasions due to its pleasant taste and aroma.

Shrikhand is a semi soft, sweetish sour, whole milk product prepared from lactic fermented curd. The curd (dahi) is partially strained through a cloth to remove the whey and thus produce a solid mass called chakka (the basic ingredient for Shrikhand). This chakka is mixed with the required amount of sugar and flavouring agents, condiments, nuts and fruits pulp *etc*., to yield Shrikhand. For overviewing goodness of fermented milk products for his nutritive as well as its flavour, taste and palatable nature and possible therapeutic values (Jadhav *et al.,* 2019).

FAO and WHO defines prebiotics as a non-viable food component that confer health benefit on the host associated with modulation of the microbiota for example dextrine, maltodextrine *etc*. Dextrin is one of the prebiotic which is partially hydrolyzed starch converted by heat alone, or by heating in the presence of suitable acids and buffers (Potter, 1973).

Papaya (*Carica papaya* L.) known as the wonder fruit of the tropics can provide the essential protective nutrition for the poorest section of the society. Papaya is quite nutritious and has much therapeutic value (Pantastico, 1975). Papaya when consumed regularly ensures good supply of vitamin 'A' and 'C' which are essential for good health especially for eyesight and prevent early-stage night blindness in children. There are various medicinal and pharmacological uses of papaya fruit such as for stomachache, dysentery and chronic diarrhea, relive obesity, bleeding piles, wounds of urinary tract, skin disease psoriasis, ant implantation activity, antibacterial activity.

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MATERIALS AND METHODS

Ingredients

For preparation of synbiotic shrikhand milk was received from Dairy Farm, College of Agriculture, Dapoli, whereas *Lactobacillus caseia* probiotic culture purchased from NCDC cell, NDRI, Karnal (Haryana). The probiotic dextrine and sugar were purchased from local market Dapoli. Papaya

fruits (of local variety) were procured from Central Experiment Station, Wakavli, Dist. Ratnagiri. Fresh buffalo milk was received from Instructional Dairy Farm, College of Agriculture, Dapoli.

Preparation of Sybiotic shrikhand

The synbiotic chakka was prepared with slight modification as per the procedure given by De S. (2008) and synbiotic papaya shrikhand was prepared as per procedure given by Kolpe *et al.,* (2010) with slight modification given in below-

Analytical work

The total solids and protein content of milk and synbiotic papaya shrikhand were determined as per IS:1479 (part-II), 1961. The fat content of milk and synbiotic papaya shrikhand was determined by using standard Gerber method as per IS: 1224 (part-I), 1977. The acidity of milk and synbiotic papaya shrikhand was estimated according to IS: 1479, (part–I), 1960. The ash content of milk and synbiotic papaya shrikhand was determined as per the procedure given in

Flow Diagram for Preparation of symbiotic chakka

Receiving of milk (Buffalo)
↓
Pre-heating (40°C)
↓
Filtration/ clarification
↓
Pasteurization (75°C for 10 min)
↓
Cooling (35°C)
↓
Addition of prebiotic
(@1.5% or 2.0% or 2.5% of milk as per treatments on w/w basis)
↓
Inoculation of culture *Lb. casei* (@ 1.5%)
↓
Proper mixing
↓
Incubation (38°C for 8 hrs)
↓
Synbiotic dahi
↓
Breaking of curd
↓
Drainage of whey by hanging in muslin cloth
↓
Chakka → Whey

B) Flow chart for synbiotic shrikhand preparation

Synbiotic chakka (as per treatment of synbiotics)
↓
Addition of sugar (@ 60%)
↓
Addition of papaya pulp as per treatment on w/w basis of chakka
↓
Blending cum mixing
↓
Synbiotic shrikhand
↓
Cooling and storage (5°C).

A.O.A.C. (1975). The lactose content of milk and synbiotic papaya shrikhand was estimated by Lane Eyon method prescribed in ISI Handbook (1981).

Sensory evaluation of Shrikhand samples were carried out by a semi-trained panel of eight judges of the institute by using 9-point hedonic scale. Colour and appearance, body and texture, flavor, consistency and overall acceptability sensory parameter were including for study. The data were statistically analyzed by using factorial complete randomized design.

Treatments details

D_0P_0 = Without Dextrine + without papaya pulp
D_1P_1 = Dextrine 1.5% (of milk w/w) + papaya pulp 10% (of chakka w/w)
D_2P_1 = Dextrine 2.0% (of milk w/w) + papaya pulp 10% (of chakka w/w)
D_3P_1 = Dextrine 2.5% (of milk w/w) + papaya pulp 10% (of chakka w/w)
D_1P_2 = Dextrine 1.5% (of milk w/w) + papaya pulp 20% (of chakka w/w)
D_2P_2 = Dextrine 2.0% (of milk w/w) + papaya pulp 20% (of chakka w/w)
D_3P_2 = Dextrine 2.5% (of milk w/w) + papaya pulp 20% (of chakka w/w)
D_1P_3 = Dextrine 1.5% (of milk w/w) + papaya pulp 30% (of chakka w/w)
D_2P_3 = Dextrine 2.0% (of milk w/w) + papaya pulp 30% (of chakka w/w)
D_3P_3 = Dextrine 2.5% (of milk w/w) + papaya pulp 30% (of chakka w/w)

RESULTS AND DISCUSSION

The chemical analysis indicated that the buffalo milk used for synbiotic papaya shrikhand preparation had average 6.18 per cent fat, 15.49 per cent total solids, 3.94 per cent protein, 0.145 per cent acidity, total sugar 4.97 per cent and 0.80 per cent ash. All these values lie within the range of legal standards for buffalo milk as described by PFA rules, 1976 and papaya pulp had 10.60 per cent, fat 0.10 per cent, protein 0.50 per cent, total sugar 9.50 per cent, ash 0.5 per cent, titrable acidity 0.075 per cent (Table 1).

Chemical analysis of synbiotic papaya shrikhand

Total solid content

The total solids content of synbiotic papaya shrikhand (Table 2 and Fig 1) shows significant decrease with the increase in level of dextrine and papaya pulp. As level of dextrine increase there was decrease in TS content due to the fact that addition of dextrine helps in boosting growth of probiotic micro-organisms. These microbes consume TS *i.e*., mineral matters, lactose, protein so TS content has been found to decrease. Present study finding was quite similar with finding reported by Salunke *et al.* (2005) and Singh (2006) who work on utilization of fermented milk product.

Fat content

Fat content of synbiotic papaya shrikhand (Table 2 and Fig 1) decreases significantly with increasing level of dextrine. As level of dextrine increase there was decrease in fat content may be due to the fact that addition of dextrine helps in boosting growth of probiotic micro-organisms. Some of microorganisms from culture used may be of lypolytic in nature which might have resulted in splitting of fat.

Protein content

Protein content of synbiotic papaya shrikhand (Table 2 and Fig 1) was decreases significant with increase in level of dextrine. As level of dextrine increase there was decrease in protein content may be due to the fact that addition of dextrine helps in boosting growth of probiotic micro-organisms. Some of microorganisms from culture used may be of protiolytic nature which might have resulted in degradation of protein.

Total sugars

Total sugars content of synbiotic papaya shrikhand (Table 2 and Fig 1) was significantly decreases with addition of dextrine. There was decrease in total sugar content may be due to the fact that addition of dextrine helps in boosting growth of probiotic micro-organisms. Most of microorganisms present in culture are known to consume lactose for their growth and multiplication because lactose is most suitable substrate for growth and multiplication of these microbes. So total sugar decrease with increasing level of dextrine.

Ash content

The ash content of synbiotic papaya shrikhand (Table 2 and Fig 1) decreased non significantly with increasing level of dextrine. As level of dextrine increase there was decrease in ash content may be due to the fact that addition of dextrine helps in boosting growth of probiotic micro-organisms. Some of micro-organisms consumes mineral matter present in culture are known to consume lactose for their growth and multiplication because lactose is most suitable substrate for growth and multiplication of these microbes.

Acidity

The titrable acidity of synbiotic papaya shrikhand (Table 2 and Fig 1) increase significantly with increase in level of dextrine but decrease significantly with increase in level of papaya pulp. As level of dextrine increase there was increase

Table 1: Chemical composition of buffalo milk and papaya pulp.

Constituents	Buffalo milk	Papaya
Total solids	15.49	10.53
Fat	6.18	0.25
Protein	3.94	0.59
Ash	0.80	8.27
Total sugars	4.97	0.28
Acidity	0.145	0.093

in titrable acidity may be due to the fact that addition of dextrine helps in boosting growth of probiotic micro-organisms. These microbes consume milk constituent's *i.e*., mineral matters, lactose, protein, fat *etc*, so titrable acidity content has been found to increasing. As level of papaya pulp increases there was reduction in acidity it may be due to fact that fresh papaya pulp contents very negligible amount acidity.

Sensory quality of synbiotic papaya shrikhand

Sensory evaluation of any dairy product is the best method of judging the acceptability of the product by the consumers.

Colour and appearance

Acceptance of milk and milk products largely depends on its colour and appearance hence, colour and appearance is an important sensory attribute of milk and milk products. The highest score for colour and appearance (Table 3 and Fig 2) recorded to treatment D_2P_2 (score 8.4) and lowest recorded to treatment D_3P_3 (score 7.2). Score increases from 10 per cent papaya level to 20 per cent papaya pulp but decreases from 20 per cent to 30 per cent papaya pulp because proper blending of chakka and papaya didn't observed due to higher moisture (89.40%) in 30 per cent papaya pulp as it produce slightly watery effect to finished product.

Flavour

The highest score (score 8.35) was recorded by treatment D_0P_0 (Table 3 and Fig 2) and lowest score (score 6.55) was recorded by treatment D_3P_3 (score 6.55). As level of papaya pulp increases there is decrease in score for flavour attribute is the indicating of fact that papaya pulp has negative impact on flavour character it may be due to fact that papaya pulp do not possess very attractive flavour like mango so instead of enhancing the flavour it might have resulted in giving negative impact on flavour attribute.

Body and texture

The highest score (score 8.5) is recorded by treatment D_2P_2 (Table 3 and Fig 2) and lowest score (score 6.71) was recorded by treatment D_1P_1, D_3P_3. There were significant differences found among the treatments.

Overall acceptability

The highest score (score 8.55) is recorded by treatment D_2P_2 (Table 3 and Fig 2) and lowest score (score 6.55) was recorded by treatment D_3P_3. There were significant differences found among the treatments.

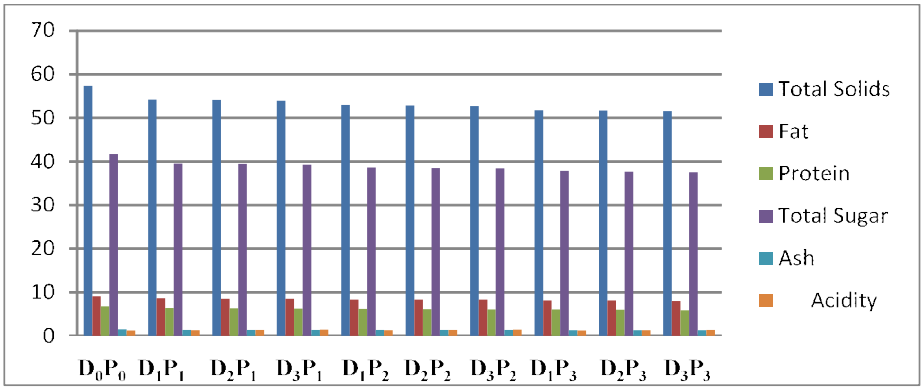

Fig 1: Chemical composition and Ash content of synbiotic papaya shrikhand.

Table 2: chemical composition and Ash content of synbiotic papaya shrikhand.

Treatment	Total Solids(%)	Fat (%)	Protein (%)	Total Sugar (%)	Ash (%)	Acidity (%)
D_0P_0	57.354	9.1	6.776	41.692	1.475	1.19
D_1P_1	54.22	8.6	6.360	39.554	1.375	1.28
D_2P_1	54.114	8.5	6.281	39.442	1.370	1.37
D_3P_1	53.952	8.5	6.216	39.278	1.353	1.43
D_1P_2	52.96	8.3	6.210	38.652	1.340	1.26
D_2P_2	52.848	8.3	6.118	38.492	1.340	1.34
D_3P_2	52.728	8.3	6.038	38.424	1.320	1.39
D_1P_3	51.78	8.1	6.038	37.832	1.310	1.21
D_2P_3	51.67	8.1	5.972	37.666	1.310	1.28
D_3P_3	51.56	8.0	5.880	37.558	1.290	1.32
SE	0.03213	0.0395,	0.02312	0.14181	0.00682	0.09827
CD	0.06516	0.08011	0.0469	0.2876	0.01383	0.19929

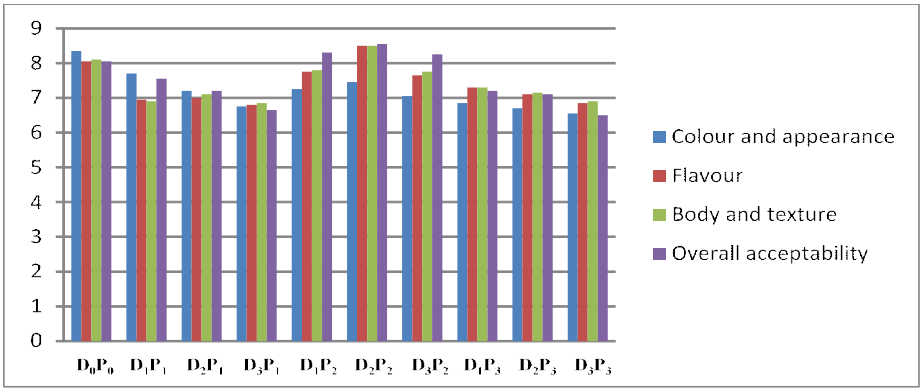

Fig 2: Sensory quality of synbiotic papaya shrikhand.

Table 3: Sensory quality of synbiotic papaya shrikhand (Out of Nine).

Treatment	Colour and appearance	Flavour	Body and texture	Overall acceptability
D_0P_0	8.35	8.05	8.10	8.05
D_1P_1	7.70	6.95	6.90	7.55
D_2P_1	7.20	7.00	7.10	7.20
D_3P_1	6.75	6.80	6.85	6.65
D_1P_2	7.25	7.75	7.80	8.30
D_2P_2	7.45	8.50	8.50	8.55
D_3P_2	7.05	7.65	7.75	8.25
D_1P_3	6.85	7.30	7.30	7.20
D_2P_3	6.70	7.10	7.15	7.10
D_3P_3	6.55	6.85	6.90	6.50
SE	0.12987	0.10526	0.12497	0.09354
CD	0.2634	0.21348	0.25345	0.18971

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