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AUGMENTATION OF SENSORY PROPERTY OF GOAT MILK DAHI BY MANGO FORTIFICATION

CHAVADA, P. J.[1]*, BARIYA, A. R.[2], MAKWANA, M. D.[3] SOLANKI, H. H.[4], NALWAYA, S. B.[5] AND ROY, S. K.[6]

[1*, 2, 3,5 & 6] (EX-PROFESSOR AND HEAD) DEPARTMENT OF LIVESTOCK PRODUCTS TECHNOLOGY, VETERINARY COLLEGE,

[4] (DEPARTMENT OF GYNAECOLOGY AND OBSTETRICS) SARDARKRUSHINAGAR DANTIWADA AGRICULTURAL UNIVERSITY, SARDARKRUSHINAGAR - 385 506.

Corresponding author's e-mail: dr.parvejkhan91@gmail.com

ABSTRACT:

In this experiment, Improvement in organoleptic quality of Goat milk dahi were carried out by mango pulp fortification. For this purpose, selection of best mango pulp level among 5% (S_1), 10% (S_2) and 15% (S_3) (v/v) was carried out on the basis of subjective method of sensory analysis by seven semi trained judges. Due to high overall acceptability among treatments, 10% (v/v) mango pulp fortified Dahi sample (S_2) was considered superior to S_1 and S_3. Therefore, 10% mango pulp (v/v) judged as best optimize level of mango pulp for mango fortified dahi preparation. Total solids percentage and titrable acidity of final product were higher than control, due to mango pulp addition while syneresis was low (6.66 ml) than control (13.33ml).

KEY WORD: *Hedonic scale, Dahi, Starter culture.*

INTRODUCTION:

Now-a-days, in the era of functional foods, an increasing interest has been seen in foods that contribute positive effect on health besides their nutritional value. Among functional foods, Dahi earned more attention because it has beneficial effect on the health of the consumer (Salminen *et*

al., 1999). Fermentation preserves the medicinal property of goat milk and increases the shelf life. Moreover, its microbial enzyme generates bioactive peptides which are responsible for functionally beneficial effect (Gobbetti *et al*., 2002).

Russian biologist named Ilya Iliych Metchnicov postulated that the long lifespan of the Bulgarians peasants were as a result of heavy consumption of yoghurt (Obi *et al*., 2009). More ever, it has shown that lactic acid Bacteria has the capacity to synthesize Gamma Amino butyric Acid (GABA), which is well known for its neuro-modulatory function (Jacobs *et al.*, 1993; Guin Ting Wong *et al.*, 2003). Dahi can be prepared by using starter culture namely, *Lactococcus lactis* spp. *lactis*, *Lactococcus lactis* spp. *cremoris* and mesophilic dairy starter cultures. However, due to a low buffering capacity of goat's milk (Rysstad and Abrahamsen, 1983) and Goaty flavour, the manufacturing of same from Goat milk creates problem of over-acidification. Low Total Solids and Casein content in goat milk (Brozos *et al*., 1998 and Haenlein, 2004) influence the rheological properties of the coagulum in goat's milk that is almost semiliquid. Texture of dahi is an important attribute that determine acceptability and identity of the final product (Shaker *et al.*, 2000).

To obtain a satisfactory curd tension and supress the goat flavour, an increase in the content of non-fat solids is required (Haenlein *et al*., 1992). To solve these problems, one approach could be addition of different fruit pulp depending upon its availability, Nutritive value through increasing Total solids and good sensory quality. Fruits addition makes the goat milk Dahi more attractive due to colour and improves the nutritive value of dahi. Fruit pulp such as mango is a good option as now a day, it is available throughout the year irrespective of season. From these concepts, this research was conducted to prepare and evaluate the quality of dahi using mango juice at different levels.

MATERIAL AND METHODS:

Ingredients

The goat milk (Mehsani goat) having 3.6% fat and Cow milk having 4.4% fat was obtained from Livestock Research Station (LRS), S.D.A.U., S.K.Nagar. Goat milk powder was prepared through spray dried method in the mini dairy plant, Shree G.N. Patel college of Dairy science and Food technology according to method of AOAC (1990). Mango pulp tins, having specific gravity 1.043, were collected from the Mini Dairy plant, Shree G.N. Patel, college of Dairy Sci. & Food technology, S.D.A.U., Sardarkrushinagar-385506.

Starter culture

Dahi starter culture NCDC 352 (mesophillic mixed dahi culture) was collected from National collection of dairy culture (NCDC), NDRI, Karnal.

Experimental design

After collection, Quality testing of Goat milk and cow milk on the basis of fat and S.N.F percentage were carried out. Goat milk was standardized at 14% total solids by using Goat milk powder. After standardization, milk was heated to 90-95 ^{0}C for 5 minutes. Similar heat treatment was given to cow milk. After completion of heating, the mixtures were taken off the burner and allowed to cool down to 40^{0}C. When the Goat milk's temperature reached 37°C, it was divided over three sterile beaker (200ml). Mango pulp was incorporated into each beaker at the ratios of 5%, 10% and 15%, while in control, Cow milk was taken and added 10% mango pulp as per the review. After the addition of NCDC 352 (mesophillic mixed dahi culture) at 3% level, the beakers were placed in the incubator at 37°C until complete coagulation (8-12 hours) was achieved. When pH of the sample reached 4.6, then incubation of the test sample ceased. Evaluation of sensory quality of prepared dahi was carried out using 9-point hedonic scale. After preparation of product, chemical analysis was carried out as per AOAC Method.

Chemical Analysis

Quality of collected milk sample was measured by measuring Tirable acidity (%) with N/10 sodium hydroxide (NAOH) solution titration method described by Aggarwala and Sharma (1961), Total Solid (TS %) with oven dry method as stated by AOAC (1990) and Syneresis. After preparation of Mango Fortified Goat Milk Dahi, Acidity (%) and Total Solid (TS %) were determined by same method as above.

Statistical analysis

The data generated on various parameters were statistically analyzed by One-way ANOVA with the help of IBM SPSS STATASTICS 20 Software as per the method described by Snedecor and Cochran (1994).

RESULTS AND DISCUSSION:

Mango pulp level selection by sensory analysis

Best level of mango pulp was selected by sensory analysis using 9-point hedonic scale.

Colour and appearance:

The colour and appearance scores of experimental samples of Mango fortified Goat milk dahi treatments S_1, S_2 and S_3 against Control (S_0) (Mango fortified Cow milk dahi containing 10% mango pulp) were presented graphically in Fig. A. It is evident from the results that increase in the level of mango pulp had no statistically significant effect on colour and appearance scores of experimental

samples compared to the control (Table 1). However, the mean score of Control (Sample S_0) was highest than the experimental samples (S_1, S_2 and S_3).

Colour and appearance score make all samples indifferent. However, Sample S_2 displayed highest mean score among Goat milk treatments. The mean score of treatments and control are in **very good range** in 9-point Hedonic scale. It might be due to the addition of mango pulp increases the colour and appearance score of dahi. These results are in agreement with the findings of Ara *et al*. (2015) and Kabir *et al*. (2014).

Effect of mango pulp level on the Flavour score:

The flavour scores of Mango fortified Goat milk Dahi at different Mango pulp level was presented in Fig. B. From table 1, it was noticed that increase in the level of mango pulp had no statistical significant difference ($p \geq 0.05$) on flavour scores. Flavour score of treatments S_1, S_2 and S_3 showed no statistical significant difference with the flavour score of Control (Sample S_0). However, the mean Flavour score of control was highest (Table 1).

It is evident from the table 1 that mean score of S_3, containing 15% mango pulp, awarded highest flavour score among goat milk treatments. The flavour score show increase trend in relation to increases in the level of mango pulp. It might be due to the presence of higher level of volatile compound responsible for high mango flavour in the Sample S_3. The results of this experiment are in agreement with Ara *et al*. (2015) and Kabir *et al*. (2014).

Effect of mango pulp level on the body and texture score:

The results of body and texture parameters of control and experimental samples were entirely different from flavour, colour and appearance results. Body and Texture score of dahi Control (S_0) and Samples (S_1, S_2 and S_3) were presented diagrammatically in Fig. C. During Body and Texture perception, sensory panellist rated considerably lower score for Sample (S_1, S_2 and S_3) of Mango fortified Goat milk Dahi, which is significantly lower ($p<0.05$) than Control (S_0) (Table 1). However, Sample S_2 was superior among treatments.

Statistical analysis showed that there was significant difference between the body and texture scores of Control (S_0) and Goat milk treatments (S_1, S_2 and S_3) (Table 1). Highest body and consistency score was found in Sample S_2, developed by using 10% (v/v) of mango pulp level. It might be due to increase in mango pulp level leads increment in the Total solids of dahi. However, higher level of mango pulp might be responsible for the increase in acidity, which has adverse effect on the body and texture. Therefore, the score of S_3 was less than the score of S_2. Present findings are in line with Hossain *et al*. (2012) and Chye *et al*. (2012).

Effect of mango pulp level on the Overall acceptability score:

The mean values of Overall acceptability were presented in Fig. 4. Similar to Body and texture result**,** Overall acceptability score of sample S_2, 10% mango pulp containing goat milk dahi treatment, was higher than other treatments (Fig. D). However, they were no statistical difference among the Mango fortified Goat milk Dahi samples (S_1, S_2 and S_3) (Table 1). However, Control (Sample S_0) showed statistically significant difference with Mango fortified Goat milk Dahi samples (S_1, S_2 and S_3) (Table 1). Finally, it was concluding that only Sample (S_2), Goat milk dahi containing 10% Mango pulp was adjudged as best by the panel due to higher mean overall acceptability score among Goat milk treatments.

Overall acceptability score of selected S_2 varied statistically significant from the highest score awarded Control (Sample S_0) (Table 1). These findings are in agreement with the findings of Ara *et al.* (2015) and Kabir *et al.* (2014). Nazni and Komathi (2014) and Staffolo *et al.* (2003) reported that fortification increases the overall acceptability of Goat milk dahi.

Chemical composition:

The total solids content of control is slightly higher than that of developed product from goat milk (Table: 3). This is due to the composition of milk used for the preparation of Dahi. Similar result was found by Manjunath and Abraham (1986). Patel (2014) reported that total solids percentage of cow milk is higher than goat milk. This result was also in agreement with the result of Kabir *et al*. (2014); they reported that total solids percentage of mango juice goat milk yoghurt was lower than mango juice cow milk yoghurt. After standardization by using goat milk powder, total Solids level were set at 14%. Similar standardization was carried out by Duitschaever (1978). Walstra *et al.* (2006) and Sfakianakis *et al.* (2014) had carried out standardization in their study by using Skim milk powder, whey protein concentrate and casein powder. Titrable acidity of Goat milk after standardization was higher than the Cow milk. It might be due to increasing in total solids percentage. Singh *et al*. (2007) reported that titrable acidity increases with relation to the percentage of total solids increases.

It was found from the result that the titrable acidity of mango fortified Goat milk dahi was higher than that of cow milk dahi (Table 4). It might be due to the activity of starter culture for the production of lactic acid in the milk, addition of mango pulp and stabilizer. Patel (2014) and Palanidorai *et al*. (2009) reported that higher titrable acidity of goat milk yoghurt is due to the activity of dahi starter culture. Manjunath and Abraham (1986) reported that goat milk yoghurt showed an increased rate of lactic acid production than cow milk yoghurt. Ara *et al.* (2015) reported that fortification by mango pulp increases titrable acidity because of higher concentrations of fermentable sugars in fruit juice which promotes acid formation. Similar results were found by Damunupola *et al*. (2014).

Syneresis value of mango fortified dahi was less than control counterpart. The higher syneresis in control (S_0) might be due to addition of mango pulp which increases the fermentable sugar percentage, which increases the lactic acid production. Therefore, due to high acidity, the syneresis value might be higher in control (Kabir *et al*., 2014). Although, mango pulp was also added in treatments, syneresis was low with compare to control. It might due to the addition of 2% stabilizer. The results agreed with the findings of Ibrahim and Ara *et al.* (2015). They stated that acidity and syneresis are obligatory rely on stabilizers type and addition rate. They also reported that water holding capacity and susceptibity to syneresis of camel milk yogurt were significantly affected by type and quantity of stabilizer used.

CONCLUSION:

In this experiment, optimization of mango pulp level was carried out for mango fortified dahi preparation. Screening was carried out among 5%, 10% and 15% (V/V) level of mango pulp on the basis of sensory analysis using 9-pont Hedonic scale. Due to mango addition, increment in the flavour, colour – appearance and body-texture were revealed by high score given by panellist. It was noted that "Goaty" odour completely masked by mango flavour. Therefore, one big problem of goat milk products was solved in this stage. On the basis of mean overall acceptability score, 10% (v/v) inoculum level selected as best for the mango fortified goat milk Dahi preparation.

The chemical evaluation revealed that before standardization of goat milk, total solids percentage of cow milk was higher than goat milk, while titrable acidity was equal. After standardization, total solids percentage of Goat milk was similar to cow milk. However, titrable acidity was found increased in Goat milk after standardization. Total solids percentage and titrable acidity of mango flavoured goat milk dahi were higher than control. However, syneresis value of mango fortified goat milk dahi was low than the control.

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Table 1: Effect of mango pulp level on the sensory score of mango fortified goat milk dahi

Treatments	Mango pulp level conc. % (v/v)	Colour and Appearance Score **Mean±S.E.**	Flavour Score. **Mean±S.E.**	Body and Texture Score **Mean±S.E.**	Overall acceptability Score **Mean±S.E.**
Sample S_0	10%	8.50 ± 0.34^a	8.66 ± 0.21^a	8.33 ± 0.21^b	8.5 ± 0.34^b
Sample S_1	05%	8.00 ± 0.36^a	8.16 ± 0.40^a	5.33 ± 0.16^a	7.16 ± 0.30^a
Sample S_2	10%	8.33 ± 0.21^a	8.33 ± 0.21^a	5.83 ± 0.25^a	7.50 ± 0.2^a
Sample S_3	15%	7.83 ± 0.42^a	8.50 ± 0.22^a	5.50 ± 0.33^a	7.27 ± 0.21^a

Mean ± S.E, n=3

*Superscripts are to be read column wise for mean comparison.

*Mean with similar superscripts in column do not differ significantly ($p>0.05$); n=7

S_0 = Control; S_1= treatment with 5% Mango pulp, S_2= treatment with 10% mango pulp and S_3= treatment with 15% mango pulp (v/v).

Table 2: Chemical composition of cow milk and goat milk used for preparation of Dahi

Quality Attributes	Control (cow milk)	Goat milk	Goat milk after standardization
Total Solid (%)	13.94 ± 0.17	10.89 ± 0.32	14.025±0.075
Titratable Acidity (% L.A.)	00.13 ± 0.02	00.13 ± 0.02	00.15±0.04

Mean±S.E., n=3

Table 3: Chemical composition of cow milk Dahi (control) and Mango fortified goat milk Dahi (MFGD)

Quality Attributes	Control	Final Product Sample S_3
Total Solid (%)	13.4 ± 0.90	16.1 ± 0.15
Titratable Acidity (% L.A.)	0.73 ± 0.03	0.90 ± 0.04
Syneresis (ml)	13.33±0.33	6.66 ± 0.20

Mean±S.E., n=3, * Sample S_3= 10% mango fortified (v/v) dahi

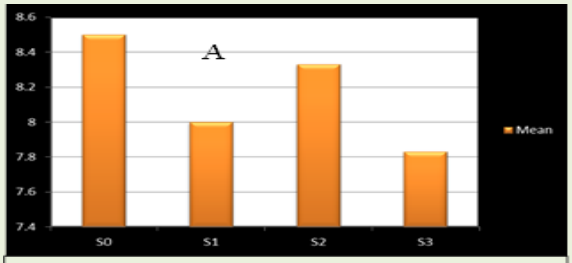

Fig. A: Effect of mango pulp level on the colour and Appearance score Control [S_0: cow milk + 10% mango pulp] and treatments [Goat milk + 5% (S_1), 10% (S_2) and 15% (S_3)] mango pulp.

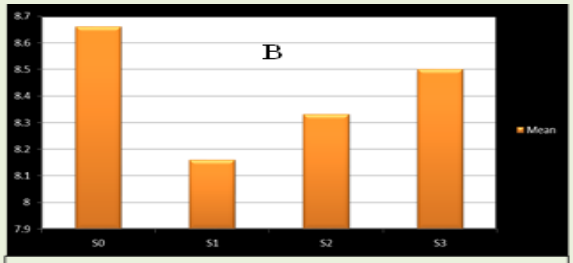

Fig. B: Effect of mango pulp level on the Flavour score of Control [S_0: cow milk + 10% mango pulp] and treatments [Goat milk + 5% (S_1), 10% (S2) and 15% (S3)] mango pulp.

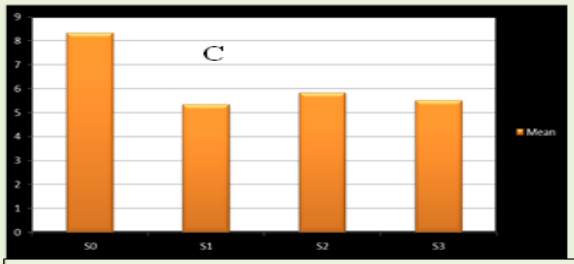

Fig. C: Effect of mango pulp level on the body and texture score of Control [S0: cow milk + 10% mango pulp] and treatments [Goat milk + 5% (S1), 10% (S2) and 15% (S3)] mango pulp.

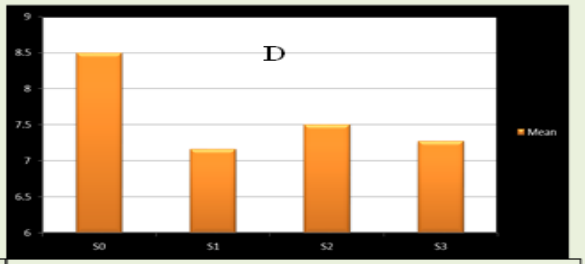

Fig. D: Effect of mango pulp level on the overall acceptability score of Control [S0: cow milk + 10% mango pulp] and treatments [Goat milk + 5% (S1), 10% (S2) and 15% (S3)] mango pulp.