Studies on effect of addition of Bajra flour on chemical properties of Dahi

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Abstract
In the present study dahi was prepared by replacing milk solids with biofortified bajra flour. Bajra flour of biofortified hybrid AHB-1200 was used which is rich in iron and zinc than local varieties/hybrids. Dahi was prepared from buffalo milk by blending with bajra flour at 2 per cent, 4 per cent, 6 per cent and 8 per cent. The requisite samples of dahi with different treatments were subjected for proximate analysis viz. Acidity, pH, fat, protein, total sugar, moisture, total solid and ash. It was observed that as the blending of bajra flour decreased there was increase in protein, carbohydrate, total solids, ash, iron and zinc whereas, decrease in moisture content of dahi.

Keywords: Dahi, chemical, buffalo milk, Bajra

Introduction
Fermented dairy foods have been an important part of human diet in many regions of the world since times immemorial. Evidences showing the use of fermented milks have been found in archeological research associated with the Sumerians and Babylonians of Mesopotamia, the Pharoes of Northeast Africa, and Indo-Aryans of the Indian subcontinent Chandan, 2002 [5]. Fermented milk also plays an important part in the issue of lactose intolerance. Such people who are intolerant to lactose may ingest fermented dairy foods, because they would have little or no lactose. With regard to the therapeutic value of fermented milk, lactic acid bacteria produce acids such as lactic acids and acetic acid that inhibit the growth of many bacteria, especially gram negative and bacteria’s which are pathogenic (Sharma, 1981) [11]. Dahi is one of the oldest fermented milk products and is the most popular one in the Indian subcontinent. This product is known by different names in different countries of the world. According to PFA (1976), dahi or curd is the product obtained from pasteurized or boiled milk by souring, natural or otherwise, by lactic acid or other bacterial culture. It is an important fermented dairy product which is used as a base to make other dairy products like lassi and shrikhand. Dahi is a rich source of protein, calcium, riboflavin, vitamin B6 and vitamin B12 and others. It is reported to have better nutritive value than milk. Lactose-intolerant persons can digest dahi, since the lactose present in milk had got converted to lactic acid by bacterial fermentation. (Wikipedia, 2012) [16]. As reported by Surra (2012) [13], dahi contains good bacteria which help in digestion process. This beneficial bacterium helps to prevent probable cancer and other forms of stomach disorder. It reduces cholesterol level and prevents heart attacks. Curd is a probiotic food whose daily intake brings about the health benefits. The protein in curd is easily digestible in comparison to that found in milk. It is found that a majority of curd is digested for the same time that a quarter of the same quantity of milk is digested. According to the research conducted, eating curd regularly can improve and strengthen one’s deficiency of phosphorus as it is good for people suffering from or at risk of osteoporosis (Verma et al., 2011) [15]. Pearl millet (Pennisetum glaucum), also known as Bajra, is one of the four most important cereals (rice, maize, sorghum and millets) mostly grown in marginal agricultural zones with inconstant, unpredictable, receives very low annual precipitation (200-500 mm) and a day temperature is above 30°C. (FAO, 2012).
Pearl millet is recognized as an important crop in developing countries to overcome with food shortages and meeting the nutritional demands of a rising population. It is an essential source of dietary calories and protein for a wide segment of the poor population in their daily diet (Simwemba et al. 1984) [12]. Bajra grains are also a rich depository of the fat-soluble retinol (vitamin A) and tocopherol (23 mg/100 g). Pearl millet contains 0.38mg of thiamine, 0.21 mg riboflavin, and 2.8 mg of niacin (Hulse et al.1980) [6]. Bajra grains contain minerals like iron, phosphorus, magnesium, and calcium in containing appreciable amounts (Burton et al. 1992) [4]. Micronutrient malnutrition, particularly vitamin A, iron and zinc-related malnutrition, has recently reported to be a most prevalent food-related health problem globally, particularly with people in those parts of the developing countries which have little access to vegetables, fruits and animal products in their meal intakes (Mason and Garcia 1993) [10]. Since the biofortification approach provides a sustainable and cost-effective solution to this problem (Bouis, 2000) [3]. The fortification of milk and dairy products with iron and zinc is considered a possible solution to avoid iron and zinc deficiency diseases. Hybrid variety AHB 1200 variety of bajra contains 88 ppm iron while others contain average 40 ppm of iron it also contains 43 ppm zinc. As milk is deficient in Iron, it was decided to add flour of AHB 1200 biofortified bajra during dahi preparation. Use of bajra flour in preparation of cereal based traditional dairy products like dahi would not only improve the product quality but also provide essential mineral like iron and zinc.

Experimental Methodology

Preparation of dahi

- Buffalo milk (6 % Fat)
- Heating (80°C/10 min)
- Addition of Bajra flour at 70°C (as per treatment)
- Heating
- Cooling (37°C)
- Addition of culture NCDC 167 @ 1.5 %
- Incubation (37°C for 12 hour)
- Dahi
- Storage (7°C)

Flow chart for preparation of dahi lassi

During this study flour of iron rich variety of bajra (AHB 1200) and buffalo milk from buffalo unit Dept of AHDS will be utilized for preparation of dahi independently. Milk was Standardize to 6 per cent fat by using Pearson’s square formula. The treatment details will be as below

Treatment combinations

| Treatment | Fat (%) | Protein (%) | Carbohydrate (%) | Ash (%) | Total Solid (%) | Moisture (%) | Iron (ppm) | Zinc (ppm) |
|-----------|---------|-------------|------------------|--------|----------------|-------------|------------|------------|
| T1        | 6.06a   | 3.89f       | 5.16a            | 0.80a  | 15.85a         | 84.15a      | 2.00a      | 3.99a      |
| T2        | 5.81b   | 4.03d       | 6.35b            | 0.82a  | 17.02b         | 82.98a      | 3.72a      | 4.78a      |
| T3        | 5.75c   | 4.11c       | 7.48c            | 0.84c  | 18.18c         | 81.82c      | 5.44c      | 5.56c      |
| T4        | 5.64d   | 4.34e       | 8.82d            | 0.87c  | 19.67d         | 80.33c      | 7.16c      | 6.34c      |
| T5        | 5.50f   | 4.42f       | 10.01e           | 0.91e  | 20.84e         | 79.16e      | 8.87c      | 7.12c      |
| SE        | 0.008   | 0.011       | 0.017            | 0.007  | 0.01           | 0.010       | 0.009      | 0.011      |
| C.D at5%  | 0.025   | 0.033       | 0.052            | 0.022  | 0.03           | 0.033       | 0.02       | 0.036      |

The values with different superscript row wise differ significantly at 5per cent level of significance.
Fat content of dahi
It is noticed from table 1 that mean fat content of dahi decreased slightly from 6.0 to 5.50 per cent. Fat content of dahi for treatment T₁, T₂, T₃, T₄ and T₅ was 6.00, 5.81, 5.75, 5.64 and 5.50 per cent, respectively. Highest fat content was observed for control sample (6.0 per cent) and lowest in treatment T₃ (5.50 per cent) which is incorporated with 8 parts of bajra flour. It might be due to lower fat content of bajra flour than buffalo milk used for preparation of dahi. Similar decreasing trend was observed by Ghule et al. (2015).

Protein content of dahi
Protein content of dahi increased from 3.89 to 4.42 per cent. The mean protein content in dahi was 3.89, 4.03, 4.11, 4.34 and 4.42 per cent for treatment T₁, T₂, T₃, T₄ and T₅ respectively. The highest protein (4.42 per cent) was observed in T₅ (8 parts of bajra flour) while lowest (3.89 per cent) was observed in T₁ (control sample). It might be due to higher protein content of bajra flour. Results obtained were comparable with findings of Syama, (2014).

Carbohydrate content of dahi
Carbohydrate content of dahi ranged from 5.16 to 10.01 per cent. The mean carbohydrate content in dahi was 5.16, 6.35, 7.48, 8.82 and 10.01 per cent for treatment T₁, T₂, T₃, T₄ and T₅ respectively. The lowest carbohydrate (5.16) was observed in T₀ while, highest (10.01 per cent) was observed in T₃. Similar increasing trend was observed by Kumar and Das (2015) [9].

Ash content of dahi
Ash content of dahi increased to some extent from 0.80 to 0.91 per cent. The mean ash content in dahi was 0.80, 0.82, 0.84, 0.87 and 0.91 per cent for treatment T₁, T₂, T₃, T₄ and T₅ respectively. The lowest ash content was observed in T₁ while highest ash content was observed in T₅ results obtained were with findings of Kiruthika et al. (2018).

Total solid content of dahi
The total solid content of dahi ranged in between 15.85 to 20.84 per cent. The mean total solid content in dahi was 15.85, 17.02, 18.18, 19.67 and 20.84 per cent for treatment T₁, T₂, T₃, T₄ and T₅ respectively. Lowest total solid content (15.85 per cent) was observed in T₀ while the highest total solid content (20.84) was found for T₅. Similar increasing trend in total solids due addition of cereal flour was similar results were obtained by Jain (2009).

Moisture content of dahi
Moisture content of dahi decreased from 84.15 to 79.16 per cent. The mean moisture content in dahi was 84.15, 82.98, 81.82, 80.33 and 79.16 per cent for treatment T₁, T₂, T₃, T₄ and T₅ respectively. Highest moisture content (84.15 per cent) was observed in T₁ (100 parts of milk), while the lowest moisture content of (79.16 per cent) was found for T₅ (8 parts of bajra flour).

Iron content of dahi
Iron content of dahi increased from 2.00 to 8.87 ppm. The mean iron content in dahi was 2.00, 3.72, 5.44, 7.16 and 8.87 ppm for treatment T₁, T₂, T₃, T₄ and T₅ respectively. The highest iron content was observed in T₅ while lowest was observed in T₁. Results were comparable with findings of Vilhekar (2014). It might be due to use of iron and zinc biofortified flour for blending.

Zinc content in dahi
Mean zinc content in dahi was 3.99, 4.78, 5.56, 6.34 and 7.12 ppm for treatment T₁, T₂, T₃, T₄ and T₅ respectively. Zinc content of dahi increased from 3.99 to 7.12 ppm. The lowest zinc content (3.99) was observed in T₁ (control sample) while highest (7.12 ppm) was observed in T₅. It might be due to higher zinc content of bajra flour used for blending. Similar results were observed by Basu and Tomar (2016).

Conclusion
It is concluded from present investigation it is concluded that due to addition of bajra flour there was increase in total solids, protein, carbohydrate, titratable acidity and ash content but decrease in fat and moisture content. Results also showed that with an increase in the bajra flour level, there was significant increase iron and zinc content of developed dahi.

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