International Journal of Veterinary Sciences and Animal Husbandry

ISSN: 2456-2912
VET 2024; SP-9(1): 104-110

www.veterinarypaper.com
Received: 03-11-2023
Accepted: 06-12-2023

Sudheer Kumar Kuswaha
M.Sc. Students, Department of Animal Husbandry & Dairying, Raja Balwant Singh College, Bichpuri Campus, Agra, Uttar Pradesh, India

PK Singh
Associate Professor, Department of Animal Husbandry & Dairying, Raja Balwant Singh College, Bichpuri Campus, Agra, Uttar Pradesh, India

KP Singh
Associate Professor, Department of Animal Husbandry & Dairying, Raja Balwant Singh College, Bichpuri Campus, Agra, Uttar Pradesh, India

Rajan Singh
Ph.D. Scholar, Department of Livestock Production and Management, (SAS) School of Agricultural Sciences, Nagaland University, Medziphema Campus, Uttar Pradesh, India

Vishaw Pratap Singh
Ph.D. Scholar, Department of Animal Husbandry and Dairy Science, Dr. Bhimrao Ambedkar University, Agra, Uttar Pradesh, India

Amratan Gautam
Ph.D. Scholar, Department of Animal Husbandry and Dairy Science, SHUATS, Prayagraj, Uttar Pradesh, India

Corresponding Author:
Rajan Singh
Ph.D. Scholar, Department of Livestock Production and Management, (SAS) School of Agricultural Sciences, Nagaland University, Medziphema Campus, Uttar Pradesh, India

A study on physico-chemical and microbial attributes of Rabri marketed in Agra city

Sudheer Kumar Kuswaha, PK Singh, KP Singh, Rajan Singh, Vishaw Pratap Singh and Amratan Gautam

DOI: https://dx.doi.org/10.22271/veterinary.2024.v9.i1Sb.943

Abstract
Background: In India, dairy farming is a significant part of the rural population, providing not only supplementary income and nutritional standards but also organic manures and draught power. Assessing the economics of milk products would be extremely beneficial in planning for the improvement of the productivity of dairy animals' products and dairy policies to increase profitability and hygienic dairy products. Rabri is a daily-based sweet popular in India. The high sugar and fat content imposes restrictions on its consumption for health reasons. A study was conducted to evaluate the chemical and sensory quality of the indigenous milk-based product "Rabri".
Methods: A total of four samples from each dairy shop were purchased and brought to the laboratory of the dairy department at Raja Balwant Singh College Agra to achieve the objectives of the present study. Samples were purchased from a randomly selected sweet or dairy shop in Agra District situated in different markets: Lohamandi, Bodala, Shikandra, and Shahganj. The concentration of different components of Rabri varied greatly from sample to sample. The economics of milk products and the resource use efficiency of milk were computed based on Rabri quality physicochemical and microbial attributes based on collected data.
Result: I calculated the physicochemical attributes of Rabri marketed in Agra city and calculated different zone attribute ranges from acid value 1.58 to 1.98, fat 15.84 to 17.34, protein 8.99 to 9.32, lactose 14.75 to 16.09, and sucrose 20.35 to 22.12 percentages, respectively. The microbial quality of Rabri marketed in Agra city was calculated for the different zones of Lohamandi, Bodla, Shikandra, and Shashganj. Total viable counts were estimated to be 20.75, 18.71, 22.05, and 15.31x103/g in Rabri the coliform count in the market Rabri sample was estimated to be 8.51, 7.47, 6.86, and 7.41/g; and yeast and mould were 12.26, 10.95, 8.16, and 9.54/g, respectively. It was observed that the physicochemical and microbial attributes of the makeup further suggest that the hygienic aspect of market Rabri is also in a poor state.

Keywords: Rabri, physico-chemical, microbial, traditional milk

Introduction
In a predominantly vegetarian population like India, milk and milk products form an essential component of the human diet, and no other single natural food meets nutritional requirements better than milk. In India, people consume milk as part of their regular diet, and hence, the consumption of fluid milk is high. Milk is the only food that is considered nature's almost perfect food. It is a treasure trove of unlimited nutrients. It is considered the best and ideal food by virtue of possessing almost all the nutritional factors, *viz*., fats, protein, carbohydrates, minerals, and vitamins. They are not only of higher quality but are present in milk in such forms and proportions that their digestion and assimilation in the body are very efficient. Milk also plays a supplementary role in our nutrition. If it is included in the diet, it enhances digestion and the assimilation of constituents of other food products. This is the reason why it is kept in high esteem as a portion of food among all animal-origin food products. India has made a commendable stride in milk production, rising from 19 million tonnes in 1951 to 187.74 million tonnes in 2019 (FAO-2020).

The demand for milk and milk products with rising income is increasing at a steady pace of over 6% per annum against the existing milk production growth rate of over 4% (Rajorhia, 1983) [23], with per capita availability of 276 gm. Today, India is the top milk-producing country in the world. A large quantity of milk produced in the country, amounting to 54 percent, is being converted into various milk products. Traditional milk products represent the most prolific segment of our Indian dairy industry. About 50 per cent of the milk produced in India is converted to traditional milk products. Most of the western-type dairy products manufactured by the organized sector of the dairy industry are reaching near saturation levels in existing domestic and international markets. Indian dairy products have not only served as a cultural link with the modern dairy industry but also provided a technological base for diversification, export promotion, and value-added products to make the modern dairy industry economically strong, enabling the milk producer to benefit from it.

Today, Indian milk products are the largest and fastest-growing segment of the dairy industry. They offer opportunities for absorbing the growing surplus of milk generated by the operation. They offer opportunities for absorbing the growing surplus of milk generated by the operation. Traditional dairy products enjoy mass appeal, have high-profit margins, and have high export potential, especially for Indians abroad. There is vast scope for the development and adoption of modern technologies in hygiene and large-scale production. There is a need for improvement in product quality, hygiene, and shelf life with modern packaging and preservation techniques.

As the milk surface simmers in the pan, it forms a skin in the air. Pieces of skin, which form on the surface of the milk, are continuously broken up and moved to a cooler part of the vessel. When the desired body and texture have been developed and the volume of milk has been considerably reduced, sugar is added. The layers of clotted cream are immersed in the remnants of the concentrated milk. The whole mass is heated for a short period of time to mix the clotted mass uniformly into the concentrated milk. The end product varies from creamy white to caramelize in colour and possesses a viscous body containing several layers of clotted cream with a chewy texture. It has a pleasant caramelized flavour and is highly nutritious as it contains about 51% total solids that consist of 16% milk fat, 10% protein, 12% lactose, and 2% mineral matter in addition to 10-12% cane sugar (Gayen and Pal, 1991b) [12]. A thorough investigation is, therefore, needed to evolve and standardize a suitable technology for the preparation of good-quality products with a view to commercializing them, which otherwise rest in the hands of local Halwais. Therefore, keeping the above facts in mind, the present investigation, entitled "A Study on Physico-chemical and Microbial Attributes of Rabri Marketed in Agra City", was undertaken to unearth the possibility of producing quality Rabri using standard technological parameters.

Materials and Methods

Traditional milk sweets are an integral part of the Indian diet and an inseparable part of all celebrations. The preparation of Indian sweets and savory dishes is an art that has developed over the centuries. Indian sweets offer a range of products that are delightfully different in terms of taste and flavour. There is immense scope for the Indian dairy industry to develop the market for indigenous dairy-based sweets by offering a range of value-added products that address the evolving nutritional and lifestyle needs of customers. With this very view, the present investigation was envisaged to explore the optimum processing parameters for the production and storage qualities of Rabri, involving various levels of fat (SNF), milk concentration, and sugar. The experiment was conducted in the Department of Animal Husbandry and Dairy, RBS College, Bichpuri, Agra. Studies were carried out to evaluate the physicochemical, sensory, and microbiological attributes of Rabri just after preparation and also during storage under less than two temperature conditions, i.e., room temperature (30°C) and refrigeration temperature (5°C), to judge its shelf-life qualities. The details of materials used and methodology employed are delineated hereunder in the following headings:

Analytical Technique

The samples of Rabri were analyzed for various attributes of quality which are narrated below.

Sensory Evaluation

The samples of Rabri were examined for sensory attributes to ensure that the product was wholesome and acceptable. The examination was done by a panel consisting of 5 judges who were well versed with the process of organoleptic evaluation. The product was examined according to the following 100 point score card as described by Pal and Gupta (1985) [33].

S. No.	Attributes	Maximum score
1	Colour & Appearance	20
2	Flavour	45
3	Body and Texture	35
4	Overall Acceptability	100

Chemical Analysis

The market samples as well as those prepared under laboratory (Control Samples) were analyzed for different constituents. In order to minimize sampling error, each sample was making as homogenous as possible. The entire content of each sample was transferred into a clean, dry glass mortar and ground thoroughly with the help of a pestle to make it homogenous. From this homogenous mass, suitable aliquots were taken up for various determinations as delineated hereunder.

Treatable Acidity

The treatable acidity of Rabri analyzed as per method described by AOAC (1980). One gram of well ground Rabri sample was taken into a clean dry porcelain dish. 10 ml of warm distilled water was added to it and was stirred with glass rod. 1 ml of phenolphthalein indicator was added to it and then the content was titrated against 0.1N NaOH till a permanent faint pink colour appeared.

$$\text{Percentage of Acidity} = \frac{\text{Volume of 0.1 NaOH used} \times 0.009}{\text{weight of rabri sample (G)}} \text{ X } 100$$

pH

$$pH = - \log(H+)$$

The pH is the measurement of the logarithm of inverse of hydrogen ions in the solution.

The pH values of Rabri samples were determined as per method of ISI with the help of electronic pH meter, as recommended by ISI, (1981). The electronic pH meter (Systolic µ pH system-361) was calibrated using 7 pH and 4 pH standard buffer solutions. Then the electrode was dipped

in the test solution (Prepared by dissolve 5g of Rabri mixed in 50 ml distilled water followed by filtration) and the temperature knob was adjusted to temperature of test solution the function selector switch was set to pH and reading of digital display was allowed to stabilized before it was noted.

Fat

% Fat = Upper Level - Lower Level

Fat content in Rabri was estimated by the Gerber method using cream butyrometer as per procedure described by ISI, (1977). For the purpose 2.5 gm of finally ground Rabri was weighed in a cup of cream butyrometer to which 10 ml H2SO4 (sp. Gravity 1.825) and 1 ml amyl alcohol (so. gravity 0.82) were carefully added. Then 10 ml of warm water was added to it and contents were shacked vigorously until the curd particles were get dissolved completely. The butyrometer was then transferred in to water bath maintained at a temperature of 700°C for 5 minutes. The butyrometer was then placed in the Gerber's centrifuge and rotated for 5 minutes at a speed of 1000 to 1200 rpm. After stipulated period butyrometer was again transferred in to the water bath maintained at a temperature of 700°C for 5minutes. The reading was then noted on graduated stem of butyrometer as:

Fat on Dry Matter Basis (FDM)

Estimation of fat on dry matter basis was done in accordance of TS content in Rabri by simple calculation as narrated hereunder.

$$\text{Percentage of FDM} = \frac{\text{Percentage of fat in Rabri}}{\text{Percentage of TS in Rabri}} \text{ X } 100$$

Determination of free Fat

Free fat in Rabri was determined according to the method described by Pruthi *et al*. (1973) [27] the details of procedure followed are given below.

Free fate was obtained by extraction of 2g of Rabri with three successive portions of 50, 25 and 25 ml of petroleum ether (B.P 400-600°C) in a Majonnier extraction flask. The clear petroleum ether extract were obtained by centrifugation. The extract was then evaporated off and weight of free fat was thus obtained.

Protein

Protein contents in Rabri were determined by the Kjeldahl methods as proposed by AOAC (1980). The details of the method followed are delineated hereunder. Two grammes of well-ground Rabri samples were weighed accurately and transferred into the Kjeldahl flask with the help of two or three people weighing each with about 10 ml of distilled water, taking care that all particles of the sample were washed down to the flask. 25 ml of condensed H2SO4 was added along the sides of the flask so that it could be absorbed by any particles of material that may be sticking to the sides of the flask. About 0.5 g of powdered Cu_SO_4 and 10 g of K_2SO_4 or Na_2SO_4 were added. The flask was then placed in an inclined position on the digestion stand. It was heated on a low flame until frothing ceased; the heating continued vigorously till the mixture became clear and the contents of the flask assumed a greenish colour. The contents of the flask were allowed to cool. Then the contents of the flask were quantitatively transferred to a one-litre volumetric flask and diluted to one litre with distilled water. A 25-ml aliquot of this diluted solution was taken in a nitrogen distillation apparatus.

$$\text{Percentage N} = \frac{\text{vol.of 0.1 N H2S04used x 0.0014 x total vol.of aliquot}}{\text{vol.of aliquot (taken ml) x wt.if rabri (g)}} \text{ X } 100$$

Percentage of Protein = Percentage N x 6.38

Lactose

Lactose content in Rabri was determined volumetrically by lane-Eynoon method as described by ISI (1973). 10 gm of well mixed Rabri sample was taken with small amount of warm water in 100 ml volumetric flask followed by addition of 50 ml distilled water 10 ml of Mayer's reagent and 2 ml N H2SO4 to it. The volume was made up to the mark (100 ml) with distilled water. The contents of the flask were well shaked and filtered through a dry Whatman No. 1 filter paper. 25 ml of filtrate was taken in a 250 ml conical flask and neutralized with N/10 NaOH using a piece of litmus paper, 20 ml. 0.1N Iodine and 30 ml N/10 NaOH were added to it and the contents were mixed by rotator movement. The flask was then kept in the dark for 20 minutes to complete the oxidation of lactose.

A blank determination was also carried out simultaneously under identical condition using 10 ml of water in lieu of the Rabri samples. The lactose content was thus calculated as.

$$\text{\% Lactose} = \frac{\text{vol. of o. 1N iodine used x 4 x 0.01705 (100} - (0.3 + \text{Fx1.11})}{\text{Weight of sample (g)}}$$

Ash

The method recommended by AOAC (1980) was employed for the determination of ash percentage in Rabri. 5 g of well mixed Rabri sample was weighed in a clean and dried silica dish of constant weight. It was placed in an oven at 100 ±2oC for one hour. The dry residue was then charred on low flame of a burner till no more fumes were produced. The dish was then placed in a muffle furnace at 550o C for about four hours. After this the dish was taken out and kept into desiccator for a little while to cool it at room temperature. The dish was then quickly and accurately weighed calculate the ash content as given below.

$$\text{Percentage of Ash} = \frac{\text{Weight of ash (g)}}{\text{Weight of Rabri sample (g)}} \text{ X } 100$$

Free Fatty Acids

%FFA=2.82xV/W

The method suggested by koniecko (1979) [18] was followed to measure the free fatty acids in Rabri samples. Five gm of Rabri sample was blended for 2 minutes with 30 ml chloroform in presence of about 5g anhydrous sodium sulphates. The contents were filtered through what man filter paper no. 1 into 250 ml conical flask. The titration of the filtrate was carried out against 0.1 N alcoholic KOH using phenolphthalein as an indicator. The quality of KOH consumed during titration was recorded and FFA content, expressed as % oleic acid, was thus calculated as under.

Where, V=Volume of 0.1N KOH required for titration (ml)
W=Weight of sample (g)

Microbial Analysis

The samples were examined for the different type of micro-

organisms as methods suggested by Chalmer (1955) [5]. The micro-organisms examined were as under.

1. Total viable plate count (cfu/g).
2. Coliform count (cfu/g).
3. Yeast and mould count (cfu/g).

Preparation of saline solution
Sodium chloride - 9.0gm.
Distilled water - 100 ml.

The salt was properly dissolved in water. It was filled in a conical flask (250 ml) in lot of 99 ml each and plugged with cotton plug. The sterile blanks were stored in a cool and dust free places.

Sterilization of glass wares: All the glass wares which are used in microbiological studies i.e, Petri plates and test tubes etc. were properly cleaned washed and then sterilized at 120°C for 4-5 hours.

Total Viable Count (TVS): The total viable count of the Rabri samples was done in standard milk agar medium for bacteria count as standard methods for the examination of dairy media used-

Standard milk agar Composition	
Yestrol	3.0 g
Peptone	5.0 g
Agar-Agar	15.0g
Fresh whole milk	10 ml
Distilled water	1000 ml
pH	6.8

Preparation of Media: The required amount or Agar-Agar was dissolved in 600 ml distilled water and coked to the desired extent. Rests of the constituents were dissolved in 400 ml distilled water and after heating they were transferred to the cooked agar-agar solution. The volume of medium was adjusted 1000 ml and the pH of medium adjusted as desired. It was filtered and sterilized at 15 LBS pressure for 30 minutes after which media were kept in cool and dry place.

Adjusted of pH: 5 ml of liquid media (40°C) were taken into two test tubes; 0.5 ml of bromo- thymol blue was added in each test tube mixed well with help of palm. The pH was determined using a pH meter. If the pH was lower than the required pH, it was adjusted with N/10 NaOH. If the pH was higher, it was adjusted using tartaric acid (10%).

Preparation of Dilution: One gm of well mixed Rabri sample was transferred to 99 ml sterilized saline blank (Havening 1% Rabri in the content). Further subsequent dilutions were made by transferring 1 ml of previously diluted solution to 99 ml saline water. Dilutions were made in such a way that the number of solution of colonies did not exceed 300 and also not less than 30 in a plate.

Preparation of plates: One ml of desired dilution sample was transferred aseptically with the help of sterilized pipette in previously lab led plate to protect the atmospheric contamination the flasks were flamed with the help of sprit lamp, after removal and before placing the plug of flasks.

Pouring of Plates: Required amount of medium was melted in boiling water in boiling water bath and then cooled to 40°C. The medium was poured into the petri-dish by gently lighting the cover of the dish. The perti-dish was rotated clock- wise and anti – clock wise to set the medium.

Incubation: When the medium had properly set, the plates were inverted and incubated at 37±1°C in BOD incubator for 24-36 or 72 hours as required.

Counting: The pin head size colonies were counted with the help of colony counter and results were interpreted as total plate count cfu/g. The total plate count was determined as follows:
Total Viable Count = No. of Colonies per Plate x no. of Serial Dilution

Coliform count: The plating and incubation (37°C for 72 hours) was done in same way as for total plate count using violet red bile salt agar medium. The counted Colonies were multiplied by number of serial dilution and presented as total coli form count. Media – Violet Red Bile salt agar.

Composition (Chalmer *et al.*, 1955) [5]

Yeast extract	3.0 g
Peptone	7.0 g
Sodium glycol of Taurochalete	15.0g
Lactose	10.0 g
NaCl	15.0 g
Agar-Agar	15.0 g
Natural red	0.03 g
Cristal Violet	0.002 g
Ph	7.4
Distilled water	1000 ml

Yeast and Mould Count

Media used Potato Dextrose Agar (PDA)	
Pealed potato	2000 g
D-glucose	20 g
Agar – Agar	20 g
Distilled water	1000 ml
pH	3.5

Result and Discussion
Quality attributes of market Rabri: As mentioned earlier, before going to conduct a detailed study on the production and handling of Rabri, a market survey was conducted at the very outset of the experiment just to become familiar with the technological know-how of this very product. The samples of Rabri were collected from Agra city by diving them into various market zones, *viz*., Lohamandi, Bodala, Shikandra, and Shahganj. These market zones were purposefully selected because more traders are involved in Rabri production in these localised areas. To reach a justified conclusion, a control sample of Rabri was also prepared in the laboratory using 6.0/9.5 fat/SNF in milk, 6% sugar, and 1/3 of milk concentration. The results thus obtained are discussed below.

Acidity: The results are contained in Table 1. Indicate that acidity content in market Rabri varied from 0.18 to 0.45 percent with a mean of 0.30 percent. The acidity content, when expressed for Rabri samples of different zones, reflected that Rabri samples of the Lohamandi market zone appeared to have a higher acidity value, i.e., 0.32 percent as against 0.29 percent in Bodala and Shikandra Rabri samples and 0.30 percent in samples procured from Shahganj market

zone. Results further indicate that Rabri samples made in control conditions using fresh buffalo milk possess 0.17 percent acidity, which is apparently lower than the market samples. Singh and Gupta (2001) [31] also reported that the market Rabri samples had a higher acidity value than control samples prepared in a laboratory and held the same contention.

Acid Value: Observations made regarding the acid value of market and control samples as contained in Table 1 revealed that this attribute ranged from 1.58 to 1.98 with a mean value of 1.75% in Lohamandi samples, from 1.67 to 2.09 with an average figure of 1.85% in Bodala samples, from 1.64 to 1.96 with a middle value of 1.80 percent in Shikandra market samples, and from 1.52 to 1.96 with a mean figure of 1.78% in Rabri samples obtained from Shahganj market zone. The overall market samples appeared to have a range of 1.52 to 2.09 with a concomitant average figure of 1.80 percent and in control samples, the average acid value was 0.70% with a CV of 8.15%.

Total Solids: Results pertaining to total solids content in Rabri samples collected from various market zones of Agra city as well as those prepared in the laboratory (control) are depicted in Table 1. It is evident from the data that the overall average total solids content in market samples of Rabri was enumerated as 66.75 percent and in control samples it was determined as 69.85 percent, respectively. Total solids content in Rabri samples collected from different market zones also exhibited variations from zone to zone. The average total solids in the Rabri sample collected from Lohamand, Bodala, Shikandra, and Shahganj were analysed as 66.90, 66.75, 66.80, and 66.50 percent, respectively. The result of the present finding is fully corroborated with the views held by Dubey and Gupta (1986) [10] and Singh and Gupta (2001) [31], who observed lower total solids content in market Rabri. Endorsing the contentions of the present finding, Gayen and Pal (1991a) [11] reported a much lower total solids value in Rabri samples collected from Delhi (55.29%) and Karnal (49.84%) markets.

Total Fat and Free Fat: Observations made with respect to total and free fat in market and control Rabri samples are presented in Table 1. A perusal of the data contained in the above-mentioned Table evinced that total fat and free fat content in market Rabri samples were relatively lower than in control Rabri samples. The total fat and free fat within market samples also varied from each other. The average total fat in market samples analysed during this course of study was 15.84, 17.34, 16.40, and 17.30 percent in Lohamandi, Bodala, Shikandra, and Shahganj market zones, respectively. The overall average fat content in market samples was 16.72 percent, much lower than control Rabri samples (21.03%). Similarly, when samples were analysed for their free fat content, the results revealed a somewhat identical trend to that held earlier for the total fat attribute. A glance into the data revealed that the average free fat in samples collected from Lohamandi, Bodala, Shikandra, and Shanganj Market Zone was estimated to be 6.75, 6.55, 5.58, and 6.36 percent respectively. The overall market Rabri samples contain 6.31 percent free fat, while the free fat content in the control sample was enumerated to be 7.58 percent. Once again, free fat content in market Rabri samples appeared to have lower values as compared to control samples prepared in the laboratory. While the total fat level in the finished product is positively associated with its initial level in the raw milk from which the product was made, the free fat in the product results from the release of globular fat, which depends upon the type and fat content and the manufacturing process. The results of the present study with regard to total and free fat in Rabri samples are in agreement with the results earlier obtained by Dubey and Gupta (1986) [10], Gayen and Pal (1991a) [12], and Singh and Gupta (2001) [31].

Table 1: Physico-chemical Attributes of Rabri marketed in Agra city

Attributes	Markets					Control	F-Value	CD-AT 5%	CV%
	Lohamandi	Bodala	Shikandra	Shahganj	Mean				
Acidity	0.29	0.30	0.29	0.32	0.30	0.17	3.027*	00.29	25.17
Acid value	1.75	1.85	1.80	1.787	1.80	0.70	9.81**	0.08	8.15
Total solids	66.90	66.75	66.80	66.50	66.75	69.85	15.69**	1.029	2.87
Fat	15.84	17.34	16.40	17.30	16.72	21.03	35.79**	0.321	3.40
Free fat	6.75	6.55	5.58	6.36	6.31	7.58	9.081**	0.089	9.15
Protein	9.14	9.328	8.99	9.05	9.12	10.98	5.37**	0.391	6.09
Lactose	16.09	15.75	16.04	14.90	15.70	17.68	39.667**	0.467	4.1
Sucrose	20.48	22.12	20.35	21.11	21.02	18.28	42.495**	0.495	3.72

Significant (p<0.05) **- Significant (p<0.05)

Protein: The Table 1 contained the data depicting protein content in Rabri samples marketed in Agra city and control samples prepared in a laboratory using fresh buffalo milk. The observations recorded indicate that protein content in market samples of Rabri ranged from 6.68 to 9.93, from 7.98 to 10.06, from 8.04 to 9.89, and from 8.26 to 9.87 for Lohamandi, Bodala, Shikandra, and Shahganj market zones, with concomitant average figures of 9.14, 9.28, 8.99, and 9.05 percent respectively. The overall average value for market samples was 9.12 percent with a range of 7.98 to 10.06 percent. The protein value in control Rabri samples was observed to be 10.98 percent. The findings of the present study with regard to protein content in Rabri samples confirmed views held earlier by Singh and Gupta (2001) [31], who reported more or less similar protein values for market and control Rabri samples.

Lactose and Sucrose: Observations made with respect to lactose and added sugar (sucrose) content in market and control Rabri samples are presented in Table 1. Results obtained with regard to lactose content in Rabri samples collected from various zones of Agra cities indicated that the average value for market samples was determined to be 15.70 percent as compared to 17.68 percent in control Rabri samples. The variations within the market samples were analysed to an extent of 16.09, 15.75, 16.04, and 14.90 percent in samples collected from Lohamandi, Bodala, Shikandra, and Shahganj market zones. When the data were

subjected to analysis of variance, it was elucidated that the mean lactose content in Rabri samples differed significantly (p<0.01).

Microbial Quality: The results obtained with regard to the microbiological profiles of Rabri as enumerated in both market and control Rabri samples are presented in Table 2. Microbial attributes, in the present investigation that was made to visualize the hygienic condition of Rabri, constitute the analysis of total viable count (TVC), coliform count, yeast count, and mould count.

Table 2: Microbial quality of Rabri marketed in Agra city

Attributes (%)	Markets Lohamandi	Markets Bodala	Markets Shikandara	Markets Shahganj	Markets Mean	Control	F-Value	CD-at 5%	CV%
Total viable count X 103/g	20.75	18.71	22.05	15.31	19.20	10.95	28.513**	2.819	25.97
Coliform count (/g)	8.51	7.47	6.86	7.47	7.56	3.98	12.841**	1.747	35.47
Yeast and moulds (/g)	12.26	10.95	8.16	9.54	10.22	6.85	7.362**	2.095	42.18

** Significant (p<0.01)

The total viable counts were estimated to be 20.75, 18.71, 22.05, and 15.31 x 103 g in Rabri samples procured from the Lohamandi, Bodala, Shikandara, and Shahganj market zones of Agra city. The overall average TVC was 19.20 x 103 g in market samples and 10.98 x 103 g in control samples. Statistical analysis of the data further revealed that the mean difference in market and control samples for TVC was highly significant (p<0.01). The significantly higher total viable count in market samples accentuates the fact that the product was contaminated during its preparation, handling, and sale. Similarly, when the observation was made for the coliform count and yeast and mould count in market and control Rabri samples (Table 2), it is evident from the result that both attributes were apparently higher in market samples when compared to their counterparts, i.e., control samples. The mean coliform count in the market Rabri sample was estimated to be 8.51, 7.47, 6.86, and 7.41/g in Lohamandi, Bodala, Shikandra, and Shahganj market zones, with a concomitant overall market mean of 7.56/g. The corresponding figures for yeast and mould were 12.26, 10.95, 8.16, and 9.54/g in samples from Lohamandi, Bodala, Shikandra, and Shanganj Market zones, with respective overall market values of 10.22/g.

Conclusions

Rabri is a whole milk product that has been condensed and evaporated to add sweetness and create a thicker malai layer. Based on the results of the present exhaustive and comprehensive experiment involving Rabri samples collected from Agra city divided into two different market zones, it could be concluded that Rabri marketed in Agra city is of inferior quality as it failed in most of its physicochemical attributes. Microbial makeup further suggests that the hygienic aspect of market Rabri is also in a poor state.

Acknowledgement

The authors duly acknowledge the financial help provided by Department of Animal Husbandry and Dairying, Raja Balawant Singh College, Bichpuri, Agra for carrying out the present study.

Conflict of Interest: None.

References

1. Singh AP, Singh PK, Singh VP. Quality attributes of Rabri marketed in Agra City. J Rural Agric Res. 2019;19(1):18-21.
2. Aneja VP, Li Z. Characterization of ozone at high elevation in the eastern United States: trends, seasonal variations, and exposure. J Geophys Res Atmos. 1992;97(D9):9873-9888.
3. AOAC. Official Methods of Analysis. 13th Ed. Association of Official Analytical Chemists; c1980.
4. Bhaskaran S. Culture's consequences: Dairy Market opportunities in India. Marketing Bulletin-Department of Marketing Massey University. 1996;7:39-50.
5. Chalmer CH. Bacteria In Relation to Milk Supply. Pub. By Edward Arnold Limited; c1955.
6. Chatterjee TK, Sarkar S, Biswas G. Quality characteristics of some marketed indigenous milk products: Major constituents and mineral composition of Rabri. J Food Sci Technol Mysore. 1994;31:426-426.
7. Chopde S, Kumar B, Minz P. Process optimization for in-line production of Rabri. Asian J Dairy Food Res. 2016;35(1):10-16.
8. Chopde S, Kumar B, Minz PS, Sawale P. Feasibility study for mechanized production of Rabri. Asian J Dairy Food Res. 2013;32(1):30-34.
9. De S. Outlines of dairy technology. Outlines of Dairy Technology; c1980.
10. Dubey PC, Gupta MP. Studies on Quality of Rabri. J Rural Agric Res. 1986;28:9-14.
11. Gayen D, Pal D. Sensory, chemical and microbiological qualities of Delhi and Karnal market samples of Rabri. Indian J Dairy Sci. 1991a;44(1):80-83.
12. Gayen D, Pal D. Studies on the manufacture and storage of Rabri. Indian J Dairy Sci. 1991b;1:84-88.
13. Ghayal G, Jha A, Sahu JK, Kumar A, Gautam A, Kumar R, Rasane P. Moisture sorption isotherms of dietetic Rabri at different storage temperatures. Int J Dairy Technol. 2013;66(4):587-594.
14. ISI. Specification of Condensed milk. IS: 1166. Indian Standards Institute, Manak Bhawan, New Delhi; c1973.
15. ISI. Method of Determination of Fat by the Gerber Method. IS: 1234, Part I. Indian Standards Institute, Manak Bhawan, New Delhi; c1977.
16. ISI. Handbook of Food Analysis. Part-XI Dairy Products. Indian Standards Institute, Manak Bhawan, New Delhi; c1981.
17. Khaskheli M, Jamali A, Arain MA, Nizamani AH, Soomro AH, Arain HH. Chemical and sensory quality of indigenous milk based product 'Rabri'. Pak J Nutr. 2008;7(1):133-136.
18. Koniecko ES. Handbook for meat chemists. CRC Press; c1979.
19. Mahadevan AP. Nutritive value of traditional milk products of India. Workshop on Indigenous Milk Products, Anand (India); c1991.
20. Mathur BN. Indigenous milk products of India: the related research and technological requirements. Workshop on Indigenous Milk Products, Anand (India); c1991.

21. Navale D, Gupta S. To Detect an Adulteration Present in Milk.
22. Pal D, Garg FC, Verma BB, Mann Minlesh. Application of Selected Membrane System for Improving the Quality of Traditional Dairy Products. NDRI, Annual report (2001-2002); c2002. p. 39.
23. Pandey RK, Chaubey AK, Chaubey CS, Verma SP. Impact of sugar level on Rabri production. New Agriculturist. 2004;15(1/2):145-147.
24. Patil MS, Dhole PT, Chavan KD. Studies on Quality Evaluation of Probiotic Custard Apple (Annona Reticulata) Dahi. Indian J Nutr. 2015;2(1):109-121.
25. Prasad J, Prasad J. Animal Husbandry and Milk Science. Kalyani Publishers; c1997.
26. Prem S, Anamika D, Khan BL. Effect of different levels of fat, concentration of milk and sugar levels on the cost of production of Rabri prepared from Bhadwari buffalo milk. Environ Ecol. 2009;27(2):725-726.
27. Pruthi TD, Raval NP, Yadav PL. A method for recovering phospholipids from ghee residue. Indian J Dairy Sci. 1973;26:151-154.
28. Rajorhia GS. New innovations in the manufacture of indigenous milk products. Indian Dairyman; c1983.
29. Shakya M, Verma P, Sandhu SS. Recent advances in microbial diversity usage in fermented dairy microbial products. In: Advances in Dairy Microbial Products; c2022. p. 19-39.
30. Sharma MP, Orga JL, Rao YS. Probable relation between chemical and microbial qualities of some indigenous milk products. Balwant Vidyapeeth Journal of Agriculture Science and Research. 1969;11:7-11.
31. Singh KP, Gupta MP. Physico-Chemical Quality of Rabbri. J Rural Agric Res. 2001;1:50-54.
32. Singh K, Ogra JL, Rao YS. Observations on the microbial quality of some indigenous concentrated milk products. Indian J Dairy Sci; c1975.
33. Deb BC, Sircar BK, Sengupta PG, Mondal S, Gupta DN, Pal SC, et al. Implementation of oral rehydration therapy in villages. The Indian Journal of Pediatrics. 1985 Sep;52:475-8.