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# Comparison of Physicochemical Properties of Raw Milk from Indigenous and Exotic Cows at Allahabad

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**Abstract:** ***The study was conducted physicochemical properties of raw milk from twenty indigenous and twenty exotic cows. It was found that the total bacterial count and the somatic cell count in milk samples were within the threshold limit values specified by relevant legal regulations. Milk from water content, fat, whey protein, total calcium, colloidal calcium and soluble calcium was found significantly in indigenous and exotic cow, but dry matter, not fat solids, lactose, total protein, casein and ionic calcium was found non significantly in indigenous and exotic cow milk composition. The surface area of fat globules ($m^2$/ml) milk is higher in indigenous cow than exotic cow non-significantly. The surface area of fat globules ($m^2$/ml) fat in higher in exotic cow than indigenous cow non-significantly.***

**Keywords:** Indigenous cow, Exotic cow, Milk composition, Fat, Protein.

## 1. Introduction

Indian dairying is emerging at an important growth level of the Indian economy. It is the single largest contributor to Agriculture sector (17%) in India, contributing about 8% to Gross Domestic Product. Milk production in India has increased fivefold in the last fifty years and it continues to be No.1 in the world The quality of raw milk is a term with a very broad meaning. It encompasses such milk characteristics as chemical composition, physical properties, microbiological and cytological quality, sensory properties, technological suitability and nutritive value. It is very difficult to assure high quality and desirable physicochemical properties of raw milk designed for processing, since this is dependent upon numerous factors, including genetic ones (*e.g.* breed). A number of authors have demonstrated that differences in the chemical composition and physicochemical properties of milk from cows of various breeds are determined genetically (Boland, 2003; Nickerson, 1999). Selection in terms of milk composition is directed towards increasing protein concentration and the protein: fat ratio. Jersey cows outclass other dairy breeds as regards the levels of milk protein, milk fat, calcium and vitamins (Fr¹ckowiak, 2004; Antkowiak *et al.*, 2004), but the value of the protein: fat ratio is lower in their milk than in milk from cows of other dairy breeds (Boland, 2003). Milk occupies a unique position among foods, being complete food for infants, good supplementary food for people of all ages and essential protective food for sick and invalids. Milk proteins are highly nutritious that effectively supplements poor quality vegetable proteins in a mixed diet% milk proteins and peptides have several therapeutic and prophylactic properties and protect against gastrointestinal disorders, hypertension and enteric infection. The aim of the present study was to compare the hygienic quality, chemical composition and physicochemical properties of milk from indigenous and exotic cows.

## 2. Materials and Method

The experimental materials comprised milk samples collected from 20 indigenous cows and 20 Exotic cows at the Research Station Sam Higgin Bottom Institute of Agriculture Technology & science Allahabad and Government Veterinary Hospital Chilla Allahabad Uttar Pradesh India, winter and spring (from November to April). The samples were taken 20 times. Chilled (temp. +4°C) and preserved (1 mL of a 2% NaN3 solution per L milk) milk samples were transported in thermal bags to the laboratory. The hygienic quality of milk was determined based on the total bacterial count (TBC), estimated with the Bactoscan 8000S apparatus, and the somatic cell count (SCC), estimated with the Fossomatic 5000 apparatus. After microbial analysis the physicochemical characteristics of milk samples were analyzed to determined chemical parameters as per method of AOAC (2000), as concentrations of non-fat solids, fat, lactose, total protein, casein and whey proteins (Buds³awski, 1973). The levels of total and soluble calcium in the supernatant obtained by ultracentrifugation of milk at 35°C and centrifugal acceleration of 68 000 g for 35 min using a centrifuge, model MLW UP 65, as described by Thompson *et al.* (1969) were determined by the complexometric method proposed by Satia & Raadsveld (1969). Ionic calcium was determined using an ionometer, model WTW ino- Lab pH/ION Level 2. Milk properties measured in the experiment included: active acidity – with a pH-meter, type WTW inoLab pH Level 1; potential acidity (Buds³awski, 1973); conductivity – with a conductometer, type WTW ino- Lab Cond Level 1; freezing temperature – with a cryoscope, type 800cl (Trident Med); and density – by the aerometric method (Buds³awski, 1973). The size of milk fat globules was estimated by the microscopic method in samples prepared according to the Polish Standard PN-A-86059:1975. Microscopic observations permitted to determine the size distribution of milk fat globules in the samples, and to calculate their volume-surface average diameters (dvs), the sur-face area of 1 mL fat and the surface area of fat

globules in 1 mL milk. The data on compositional ingredients were tabulated and subjected to analysis of variance techniques (ANOVA) as per randomized block design (RBD) of Snedecar and Cochran (1994) to determine influence of metabolic size on different chemical parameters of raw milk.

## 3. Results and Discussion

In the present study showed that milk obtained from indigenous and exotic cow was characterized by good microbiological quality (TBC 8.4´104 cfu/mL and 7.6´104 cfu/m) and cytological quality (SCC 122´103/mL and 138´103/mL), corresponding to the relevant standards established for raw milk. An analysis of the chemical composition of milk table 1 indicated that milk from water cotent, fat, whey protein, total calcium, colloidal calcium and soluble calcium was found significantly in indigenous and exotic cow, but dry matter, not fat solids, lactose, total protein, casein and ionic calcium was found non significantly in indigenous and exotic cow milk composition. According to literature data (Boland, 2003; Nickerson, 1999; Fr¹ckowiak, 2004; Skrzypek, 2001), the percentages of dry matter components, especially fat and protein, are higher in milk from indigenous cows than in milk from exotic cows. In table 2 the characteristics of milk fat dispersion in the samples analyses, based upon the results of microscopic observations and calculations, show that the fat contained in milk from indigenous cows has the form of bigger globules that the fat found in milk from exotic cow. The surface area of fat globules ($m^2$/ml) milk is higher in indigenous cow than exotic cow non-significantly. The surface area of fat globules ($m^2$/ml) fat in higher in exotic cow than indigenous cow non-significantly. The Cow breed affects not only the fat content of milk and the size of fat globules, but also the composition of fatty acids (Boland, 2003). The size of milk fat globules increases along with an increase in the fat content of milk (Wiking *et al.*, 2004). In addition, this factor affects the physicochemical properties of fat, including the composition of fatty acids (Michalski, 2004). The differences in the composition of milk fat of indigenous and exotic cow.

**Table 1:** Chemical composition of milk from Indigenous and Exotic cows, Mean values (n=20)

| Parameter Milk from | Indigenous cows | Exotic cows |
|---|---|---|
| Water (%) | 82.07±2.41[a] | 86.12±2.64[b] |
| Dry mater (%) | 14.38±1.32 | 13.96±1.46 |
| Non-fat solids (%) | 8.68±1.02 | 9.04±1.24 |
| Fat (%) | 6.32±1.06[b] | 3.98±0.93[a] |
| Lactose (%) | 5.06± 1.86 | 4.36±1.02 |
| Total protein (%) | 4.21±1.14 | 5.78±1.14 |
| Casein (%) | 2.36±0.94 | 3.64± 0.94 |
| Whey proteins (%) | 0.59±0.56[a] | 0.87±9.59[b] |
| Total calcium (mg· %) | 118.37±2.67[a] | 163.97±2.86[b] |
| Colloidal calcium (mg· %) | 76.87±1.67[a] | 112.26±2.93[b] |
| Soluble calcium (mg· %) | 39.95 ±1.46[a] | 48.71±1.67[b] |
| Ionic calcium (mg· %) | 6.93±1.07 | 8.34±1.02 |

**Table 2:** Characteristics of milk fat dispersion in Indigenous and Exotic cows, Mean values (n=20)

| Milk form | Diameter of fat globules dvs (µm) | Surface area of fat globules ($m^2$/mL milk) | Surface area of fat globules ($m^2$/mL fat) |
|---|---|---|---|
| Indigenous cows | 7.26±1.14 | 0.14±0.43 | 1.39±0.94 |
| Exotic cows | 6.69±1.76 | 0.12±0.28 | 2.79±0.79 |

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