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To analyze the chemical quality of cow milk (Protein, specific gravity and fat)

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Abstract
The present study entitled "To analyze the chemical quality of cow milk (protein, specific gravity and fat)'' was carried out during February to March 2018 at the Livestock Production and Management Department of N.R.M., M.G.C.G.V., Chitrakoot – Satna (Madhya Pradesh), to study the chemical quality of Cow milk. The data collected of animals each *viz.*, Cow, for ten days as replicates on different parameters, were statistical analysis to applying the technique of analysis of variance. The results of the investigation regarding the chemical qualities of Cow milk have been presented in tables and graphically represented in the different observation *i.e.*, protein, specific gravity & fat. The result of experiment are summarize *viz.*, higher protein percentage, specific gravity & fat percentage were recorded higher in the Cow milk.

Keywords: chemical quality, cow milk (protein, specific gravity & fat)

Introduction
Milk is a natural food and plays a significant role in nutrition growth and resistance to disease. This is mainly due to its high nutritious value especially acts as an excellent sources of Mineral (such as magnesium calcium phosphorus and potassium) vitamins (A, D,-12 and C) and protein. milk and milk products held the first position in human food, because it is or essential for growing children At the same time the composition of milk protein and fat content in milk plays a crucial role in price fixing programmes the quantity and the composition of milk mostly depend on the basal diet of the cattle's feed besides cow milk contains richest source of nutrients especially fat which is responsible for high energy and nutrition's especially fat which is responsible for high energy and nutrients value. According to the report of IDE according to (Ahmad and Aneja, 2002) [2]. Reference the buffalo milk contributes 12.5% of total milk production worldwide (82 on billion litres/year) when compared to 84% of cow milk (551 billion litres/year) Dresch referrared "goat as the poor man's cow due to its great contribution to the health and nutrition of the landles and rural people. Consumption of goat milk should be enhanced because of that therapeutic of goat milk should be enhanced because of that therapeutic properties and nutrition value. The main aim of this present study was to analyze and compare the chemical composition of cow and buffalo milk. There has been an increasing demand for cheese made of buffalo milk in many countries throughout the world as it is an organic product **(**Bilal *et al*. 2006) [4]. In mastitis milk, the changes in composition impair coagulation, cheese yield, and composition; some composition changes lead to poor quality cheese and elevated SCC were associated with the production of a cheese with high moisture content (Ng-Kwai-Hang, 1988c;). Pathogens that have been involved in food borne outbreaks associated with the consumption of milk include Listeria mono-cytogenes, *Salmonella spp.* Escherichia coli and Staphylococcus aureus. The presence of these pathogenic bacteria in milk emerged major public health concerns, especially for these individuals **(**Ryser, 1998) [10]. China is the largest producer of milk; with both buffalo herds and buffalo milk production listed third world wide in 2004 after those of India and Pakistan **(**FAO, 2004) [5]. In Tamil Nadu as per the 126th livestock and poultry census 2000 the total cattle population is 93.63 lakhs, which accounts for 35.8% of the total livestock population in the country. The milk production in Tamil Nadu has increased tremendously over the past 20 years. From only 1.74 million tonnes in 1981, it has risen to 5 million tonnes in 2001. This has resulted in increase in per capita availability of milk to 219gm per day, which is very close to

the Indian Medical Council Research (ICMR) recommendation of 220g per day **(**TNMPFL, 2000). Fresh milk drawn from a healthy cow normally contains a low microbial load (less than 1000ml-1), but the loads may increase up to 100 fold or more once it is stored for sometimes at normal temperatures (Richter *et al.*, 1992) [9]. Milk is an important part of the human diet and the nutritional significance of milk is apparent from the fact that daily consumption of a quart (1.14 liters) of milk furnishes approximately all the daily requirements from fat, calcium, phosphorus, riboflavin, one half of the protein, one third of vitamin A, ascorbic acid, thiamine and one fourth of calories needed daily by an average individual **(**Bilal & Ahmad, 2004) [3]. Numerous studies have focused on cow milk, although milks from other animal species, such buffaloes, sheep, goats and camels are essential to the human diet in various parts of the world.

Material and Methods

Collection of raw milk samples: Estimation of protein

The most widely used method for determining protein content is by Kjeldahl method for nitrogen determination. Since nitrogen is a characteristic element in protein, by its accurate determination, protein concentration can be calculated. In 1883, Johann Kjeldahl developed the basic procedure to analyze organic nitrogen. The method involves two major steps. In the first step, the protein is digested using concentrated sulphuric acid in presence of a catalyst. In this step all the organic material is oxidized except nitrogen, the reduced form of which is retained in digest as ammonium sulphate. Neutral salts such as potassium sulphate are used in the digestion step to raise the boiling point of the reaction mixture and thereby effectively increase the digestion rate. Metallic catalyst such as copper sulfate is used to hasten the digestion and clearing the reaction mixture. The digest is neutralized with alkali to liberate ammonia. In the second step, ammonia is distilled off, collected in boric acid and titrated with standard acid. Boric acid provides the most convenient absorbent for ammonia in that, the need for a standard alkali in titration is eliminated, and neither the amount nor the concentration of boric acid needs to be precise, since the boric acid itself is not involved in the titration, but simply reacts with the ammonia to form an ammonium borate complex. The strongly basic ammonium-borate that is formed is titrated directly with acid in the presence of a methyl red-bromocresol green indicator until the green distillate changes through colourless to pink. Add to the clean and dry Kjeldahl flask, 5 – 10 boiling aids, 15 g K2SO4, 1.0 ml of the copper sulfate solution, approximately 5 ml of milk sample and add 25 ml of concentrated sulfuric acid. Use the 25 ml acid also to wash down any copper sulfate solution, K2SO4 or milk left on the neck of the flask. Gently mix the contents of the Kjeldahl flask. Turn on the fume extraction system of the digestion apparatus prior to beginning the digestion. Heat the Kjeldahl flask and its contents on the digestion apparatus using a heater setting low enough such that charred digest does not foam up the neck of the Kjeldahl flask. Digest at this heat-setting for at least 20 min or until white fumes appear in the flask. Increase the heater setting to half way to the and continue the heating period for 15 min. At the end of 15 min period, increase the heat to maximum. After the digest clears (clear with light blue-green colour), continue boiling for 1 h to 1.5 h at maximum setting. The total digestion time will be between 1.8 – 2.25 h. At the end of digestion, the digest shall be clear and free of undigested material. Allow the acid digest to cool to room temperature over a period of approximately 25 min. If the flasks are left on hot burners to cool, it will take longer to reach room temperature. The cooled digest should be liquid or liquid with a few small crystals at the bottom of the flask at the end of 25 min cooling period. Do not leave the undiluted digest in the flask overnight. The undiluted digest February to March crystallize during this period and it will be very difficult to get that back into the solution to avoid this situation. After the digest is cooled to room temperature, add 300 ml of water to 500 ml Kjeldahl flask or 400 ml of water when using 800 ml Kjeldahl flask. Use the water to wash down the neck of the flask too. Mix the contents thoroughly ensuring that any crystals which separate out are dissolved. Add 5 - 10 boiling aids. Allow the mixture to cool again to room temperature prior to the distillation. Diluted digests Feb. to March is stopper and held for distillation at a later time. Titrate the boric acid receiving solution with standard hydrochloric acid solution (0.1 N) to the first trace of pink colour. Take the burette reading to at least the nearest 0.05 ml. A lighted stir plate Feb. to march aid visualization of the end point.

$$Wn = \frac{1.4007 \times (Vs - V\mathrm{B}) \times N}{W}$$

Estimation of specific gravity

Measure 10 ml of sulphuric acid into a butyrometer tube, preferably by use of an automatic dispenser, without wetting the neck of the tube. Mix the milk sample gently but thoroughly and fill the milk pipette above the graduation line. Wipe the outside of the pipette and allow the milk level to fall so that the top of meniscus is level with the mark. Run the milk into the butyrometer tube along the side wall without wetting the neck, leave to drain for three seconds and touch the pipette's tip once against the base of the neck of the butyrometer tube. Add 1 ml of Amyl alcohol, close with a lock stopper, shake until homogeneous, inverting it for complete admixture of the acid. Keep in a water bath for 5 min. at 65±2°C taking care to have casein particles if any to dissolve fully, and centrifuge for 4 min. at 1100 rpm. The tubes should be put in centrifuge, so as to conform to radial symmetry, and as evenly spaced as possible, in order to protect bearings of the centrifuge. Allow the centrifuge to come to rest. Remove the butyrometer tubes and place in water bath for 5 min. at 65±2°C. Read the percentage of fat after adjusting the height in the tube as necessary by movements of the lock stopper with the key. Note the scale reading corresponding to the lowest point of the fat meniscus and the surface of separation of the fat and acid. When readings are being taken hold the butyrometer with the graduated portion vertical, keep the point being read in level with the eye, and then read the butyrometer to the nearest half of the smallest scale division.

Estimation of Fat

The milk is mixed with sulphuric acid and iso-amyl alcohol in a special Gerber tube, permitting dissolution of the protein and release of fat. The tubes are centrifuged and the fat rising into the calibrated part of the tube is measured as a percentage of the fat content of the milk sample. The method is suitable as a routine or screening test. It is an empirical method and reproducible results can be obtained if procedure is followed correctly. Measure 10 ml of sulphuric acid into a butyrometer tube, preferably by use of an automatic dispenser, without wetting the neck of the tube. Mix the milk sample gently but

thoroughly and fill the milk pipette above the graduation line. Wipe the outside of the pipette and allow the milk level to fall so that the top of meniscus is level with the mark. Run the milk into the butyrometer tube along the side wall without wetting the neck, leave to drain for three seconds and touch the pipette's tip once against the base of the neck of the butyrometer tube. Add 1 ml of Amyl alcohol, close with a lock stopper, shake until homogeneous, inverting it for complete admixture of the acid. Keep in a water bath for 5 min. at 65±2°C taking care to have casein particles if any to dissolve fully, and centrifuge for 4 min. at 1100 rpm. The tubes should be put in centrifuge, so as to conform to radial symmetry, and as evenly spaced as possible, in order to protect bearings of the centrifuge. Allow the centrifuge to come to rest. Remove the butyrometer tubes and place in water bath for 5 min. at 65±2°C. Read the percentage of fat after adjusting the height in the tube as necessary by movements of the lock stopper with the key. Note the scale reading corresponding to the lowest point of the fat meniscus and the surface of separation of the fat and acid. When readings are being taken hold the butyrometer with the graduated portion vertical, keep the point being read in level with the eye, and then read the butyrometer to the nearest half of the smallest scale division.

The fat can be calculated using following formula-

$$\text{Fat \% (w/w)} = \frac{\text{Weight of Extracted Fat}}{\text{FatWeight of milk}} \times 100$$

Results

The present investigation entitled "To analyze the chemical quality of cow milk (protein, specific gravity and fat)" was carried out during February to March 2018 at the Livestock Production and Management Department of N.R.M., Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya, Chitrakoot – Satna (Madhya Pradesh), to study the chemical qualities of raw milk of Cow. The results of the investigation regarding the chemical qualities of milk of Cow have been presented in tables and graphically are as under;

(i) Protein (%)

The data showing protein percentage in the milk of Cow is presented in Table 1. The mean protein content in the milk of Cow in ten replications, ranged from 3.04 – 4.44 and 3.25 – 4.36, respectively (Table 1). Protein percentage in individual Cows ranged from 3.25 – 4.26, 3.36 – 4.26, and 3.49 – 4.36, with a mean of 3.82, 3.86 and 3.93 in Cow C_1, C_2 and C_3, respectively. The maximum protein percentage (3.93) was found in C_3 followed by C_2 (3.86) and C_1 (3.82) and the differences between the mean values was significant. The overall mean protein in Cow milk was found 3.87%. Highest mean protein percentage was recorded in the milk of Cow (3.82, 3.86, 3.93 and overall 3.87).

Table 1: ANOVA for Protein (%) in Cow milk

Source of variation	D. F.	S.S.	M.S.S.	F. Cal.	F. Tab 5%	Result	CD at 5%
Due to Replication	9	2.617	0.291	247.17	2.47	S	-
Due to Cow (C)	2	0.063	0.032	26.95	3.55	S	0.06
Due to Error	18	0.021	0.001	-	-	-	-
TOTAL	29	2.702	-	-	-	-	-

(ii) Specific gravity (cc)

The mean specific gravity (cc) in the milk of Cow is (average of three animals) in ten replications, ranged from 1.036 – 1.059 and 1.026 – 1.062, respectively. Specific gravity (cc) in individual Cows ranged from 1.025 – 1.061, 1.026 – 1.062, and 1.026 – 1.061, with a mean of 1.047, 1.047 and 1.047 in Cow C_1, C_2 and C_3, respectively. The differences between the mean values were non-significant. The overall mean specific gravity of Cow milk was found 1.047 cc. Higher mean specific gravity was recorded in the milk of Cow (1.047, 1.047, 1.047 and overall 1.047).

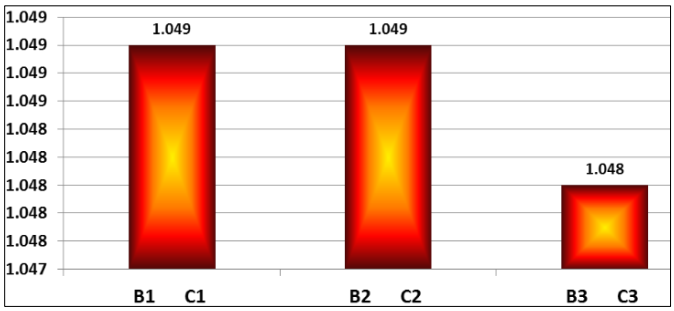

Fig 1: Specific gravity (cc) of Cow

(iii) Fat (%)

The mean fat content in the milk of Cow in ten replications, ranged from 5.04 – 6.62, and 3.20 – 5.32, respectively. Fat percentage in individual Cows ranged from 3.26 – 5.31, 3.20 – 3.5.26, and 3.26 – 5.32, with a mean of 4.40, 4.34 and 4.44 in Cow C_1, C_2 and C_3, respectively. The maximum fat percentage (4.44) was found in C_3 followed by C_1 (4.40) and C_2 (4.34) and the differences between the mean values was significant. The overall mean fat in Cow milk was found 4.39%. Higher mean fat percentage was recorded in the milk of Cow (4.40, 4.34, 4.44, and overall 4.39). The differences in the fat percentage in Cow milk due to different animals, three each, as also due to replication, were significant.

Discussion

The results of the investigation regarding analyze chemical qualities of Cow milk have been discussed are as under, Protein (%), furnish the data on protein percentage in raw milk of Cow. The results obtained showed that Cow registered mean protein percentage as 3.70, 3.58, 3.65 (overall 3.64) respectively. The differences in the values due to three animals each, as well as due to replication, were found significant. Specific gravity (%), contain the data on specific gravity (cc) of raw milk of Cow. The results obtained showed that Cow registered mean specific gravity as 1.049, 1.049, 1.048 (overall 1.049) cc, respectively. The differences in the values due to three animals each were found non-significant, whereas due to replication the differences were significant. Fat (%) - The data on fat percentage in raw milk of Cow is furnished in Table 1. The results contained in the Table showed that Cow registered mean fat percentage as 5.84, 5.60, 5.67 (overall 5.70), respectively. The differences in these values due to three animals each, as well as due to replication, were found significant.

Summary

The present study entitled "To analyze the chemical quality of cow milk (protein, specific gravity and fat)" was carried out during Feb. to March 2018 at the Livestock Production and Management Department of N.R.M., M.G.C.G.V., Chitrakoot – Satna (M.P.), to study the chemical qualities of Cow milk. The data collected for three animals each, *viz*., Cow, for ten days as replicates, on different parameters, were statistical analysis to applying the technique of analysis of variance. The results of the investigation regarding the chemical qualities of

Cow milk have been presented in tables, graphically represented in the different observation. Results of the experiment are summarize *viz.*, Higher protein percentage was recorded in the milk of Cow as compared to other milk, Specific gravity, Fat percentage was recorded higher in the milk of Cow milk.

Conclusion

In view of the results presented above, it Feb. to March be concluded that the analyze of chemical quality of Cow milk. All the animals showed considerable variation regarding the principal components in milk. In earlier studies, cow milk showed advantages compared to other animal milk with regard to milk components. cow milk should also be preferred from a nutritional point of view because of their high protein content and type, free amino acids, naturally occurring peptides, fat content, conjugated linoleic acid precursors and isomers, total unsaturated fatty acid, lactose, minerals, Ca, P, Mg, Mn and Zn. They were also low in α_{s1}-casein and β-lacto globulin, the two major milk allergen.

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