



Original Research

Effect of the Sex of New Born During Various Days of Transition Period on Various Physico-Chemical, Compositional and Microbiological Characteristics of Bovine Colostrum

Tahir Nazir^{1*}, Mohammad Ashraf Pal¹, Firdous Ahmad Baba², Ashaq Manzoor², Asif Hassan Sofi¹ and Sheikh Rafeh Ahmad¹

Faculty of Veterinary Sciences and Animal Husbandry, SKUAST-K-190006, Jammu and Kashmir, INDIA

¹Division of Livestock Products Technology

²Division of Livestock Production and Management

*Corresponding author: thrnzr@gmail.com

Rec. Date:	May 07, 2018 13:40
Accept Date:	Jul 31, 2018 16:58
DOI	10.5455/ijlr.20180507014059

Abstract

The current investigation was undertaken with the aim of studying the effect of the sex of new born during various days of transition period on various physico-chemical, compositional and microbiological characteristics of bovine colostrum. With regards to the effect of sex of the new born on various physico-chemical, compositional and microbiological characteristics of colostrum, the specific gravity, fat, total protein, casein protein, whey proteins, Lactose, total solids, solids not fat, and electrical conductivity of the colostrum samples obtained from the animals that had delivered a male new born was significantly ($p \leq 0.05$) higher compared to the animals that delivered the female offspring, however the sex of the new born had no significant ($p > 0.05$) effect on the ash, pH and total plate count (TPC) content of the colostrum samples.

Key words: Bovine Colostrum, Physico Chemical, Post-Partum, Quality, Sex of New Born

How to cite: Nazir, T., Pal, M. A., Baba, F. A., Manzoor, A., Sofi, A. S., & Ahmad, S. R. (2018). Effect of the Sex of New Born During Various Days of Transition Period on Various Physico-Chemical, Compositional and Microbiological Characteristics of Bovine Colostrum. International Journal of Livestock Research, 8(12), 233-246. doi: 10.5455/ijlr.20180507014059

Introduction

The composition of colostrum differs markedly from the mature milk produced later, reflecting a difference in the biological function of the two materials. Colostrum is not only a good source of nutrients, it also has biologically active substances which are important for nutrition and health. The colostrum composition changes with a number of factors. Bovine colostrum has many purported health benefits, if harvested as



soon as possible after calving to maintain colostrum quality. Colostrum is defined, as the secretion of the mammary gland produced immediately after parturition (Levieux and Ollier, 1999), during the first 24 h after calving or through the first few days after birth (Tsioulpas *et al.*, 2007). Colostrum is of therapeutic use in treatment of variety of health conditions, including gastrointestinal disorders, respiratory tract disorders, and tissue repair (Li and Aluko, 2006). Colostrum could be used for the treatment of intestinal inflammation instigated by the injurious effects of NSAID, it also has therapeutic potential for other ulcerative conditions in the bowel (Cairangzhuoma *et al.*, 2013). Colostrum is emerging as the most potent natural immune booster for human beings. Colostrum has the ability to prevent from bacteria and viruses, and to improve the gastrointestinal and body condition (Houser *et al.*, 2008). The growth factors and immune factors present in bovine colostrum are similar to those present in human colostrum but in higher quantities: IgG concentration in human colostrum is 2% while in bovine colostrum it is 86% (Wilson, 1997). Bovine colostrum rebuilds the immune system, destroys viruses, bacteria and fungi, accelerates healing of all body tissue, helps lose weight, burn fat, increase bone and lean muscle mass and slows down and even reverses aging. Keeping in view the above versatility of colostrum along with its immense food, nutritional and economic value, the present study is envisioned to help utilizing the surplus colostrum effectively for mitigating the problems such as food, nutritional insecurity and prevention of spoilage of a salubrious product: With this background the current work was undertaken with the aim of studying the effect of breed of the animal on various physico-chemical, compositional and microbiological characteristics of bovine colostrum.

Materials and Methods

Source of Colostrum

Colostrum samples were collected from the MLRI, SKUAST-Kashmir and various field locations. A total of ninety-nine samples were collected. The samples were collected in sterile containers and transported to the laboratory in ice cool totes, thereafter the samples were analyzed for the following parameters for three consecutive days post parturition as per approved procedures:

1. Specific gravity (Lactometer method)
2. Total protein (Kjeldahl/Formal titration method)
3. Casein protein (Kjeldahl/Formal titration method)
4. Whey protein (Kjeldahl/Formal titration method)
5. Fat (Gerber method)
6. Lactose (Lane-Eynon Oxidation –Reduction Reaction method)
7. Ash (Incineration method)
8. Total solids (Gravimetric method)
9. SNF (By Difference)
10. pH (Microprocessor based electrical pH meter)
11. Electrical conductivity (electrical conductivity meter)
12. Total plate count (APHA)



Chemicals

All the chemicals used were of analytical grade and were obtained from standard firms (Qualigens Fine Chemicals, Nice Chemicals Pvt. Ltd., Hi Media Lab. Pvt. Ltd. etc.).

Preparation of Samples

Colostrum Samples

Colostrum was warmed and thoroughly mixed by pouring into the clean receptacle and back repeatedly and whenever needed with plunger/stirrer to reincorporate any material adhering to containers in order to make sure that the samples collected were representative of the entire batch of colostrum that was being sampled. After thorough mixing about 200ml of colostrum was taken in sampling bottles with the help of colostrum sampler and the analysis was carried out immediately.

Laboratory Analysis

All the analytical procedures required for the analysis of colostrum were carried out in the laboratory of the Division of Livestock Products Technology, Faculty of Veterinary sciences and Animal Husbandry, SKUAST-Kashmir, Shuhama Alusteng, Ganderbal. For physico-chemical analysis about 200ml of colostrum was used for the determination of various parameters.

pH of colostrum

The pH of colostrum samples was recorded by directly dipping the combined electrode of digital pH meter (Tanco Lab. Equipments), after proper calibration of the instrument, into the samples. Two readings were taken for each sample and average pH recorded.

Specific Gravity of Colostrum

For determination of specific gravity of colostrum, Zeal type lactometer was used. After recording the temperature of the sample correctly lactometer reading was recorded. The corrected lactometer reading was calculated to arrive at the correct specific gravity

Titrateable Acidity of Colostrum

A 10ml quantity of thoroughly mixed colostrum samples were taken in a conical flask with the help of dry pipette. To this few drops of phenolphthalein indicator were added. Then the colostrum was carefully titrated against 0.1N sodium hydroxide till faint pink colour appeared and persisted for 15 seconds. The volume of 0.1N sodium hydroxide used was recorded and titrateable acidity (expressed as a percentage of lactic acid) was calculated as per formula given below-

$$\text{Per cent titrateable acidity} = \frac{\text{No. of ml of 0.1 N NaOH used} \times 0.009}{\text{Weight of sample in grams}} \times 100$$



Electrical Conductivity (EC) of Colostrum

Electrical conductivity of the samples was taken by dipping the electrode of electrical digital conductivity meter (brand “TANCO, India Lab. Equipments”) into the sample after proper calibration of instrument. Two or three readings were taken for each sample and average electric conductivity was calculated.

Proximate Composition

The colostrum samples were analyzed for determination of various physico-chemical parameters using the standard procedures of Association of Official Analytical Chemists (A.O.A.C., 1995). Brief description of the methods is outlined below:

Total Solids (TS) of Colostrum

For the determination of total solids about 10g of the colostrum sample in duplicate was weighed accurately on electronic balance, corrected up to 0.1mg, in a dry, pre-weighed, flat bottomed moisture cups and kept in hot air oven at $102 \pm 1^\circ\text{C}$ for 4 hours. Then moisture cups were transferred immediately to a desiccator to cool to the room temperature (at least 30 minutes). The process of drying, cooling and weighing was repeated at 30 minutes interval until the difference between the two consecutive weighing readings was less than one milligram. Weight loss of the cup after drying was recorded and expressed in terms of total solids percent.

Calculation

$$\% \text{ Total Solids} = [(W_1 - W) / (W_2 - W)] \times 100$$

Where,

W = weight of empty dried cup (g)

W_1 = weight of cup + sample after drying (g)

W_2 = weight of cup + sample (g)

Solids Not Fat (SNF) (Colostrum)

SNF of the colostrum was calculated by indirect method. The difference between total solids (%) and fat (%) gave the SNF content in colostrum.

$$\text{SNF (\%)} = \text{TS\%} - \text{Fat\%}$$

Fat (Colostrum)

Fat of colostrum was estimated by Gerber's method (IS: 1224 (1977). 10ml of Gerber's sulphuric acid (90ml of concentrated sulphuric acid added to 10ml of distilled water) was taken carefully in a clean dry butyrometer (ISI marked) with the help of automatic dispenser (tilt measure) without wetting the neck. To this 10.75 ml of thoroughly mixed colostrum sample was added with the help of milk pipette on the side



walls of the butyrometer. Then 1ml of amyl alcohol was added to the butyrometer on the sides. Dry rubber lock stopper was used to close the butyrometer. These were then shaken and inverted 2-3 times till complete dissolution of the acid and colostrum contents. Then tubes were placed in water bath for 5 minutes at $65 \pm 2^\circ\text{C}$ to ensure that all the casein particles were dissolved. The butyrometer tubes were then placed in a centrifuge in a radial symmetry and as evenly spaced as possible. Centrifugation was done for 4 minutes at 1100 rpm. Butyrometer tubes were then removed from centrifuge and placed again in water bath for 5 minutes at $65 \pm 2^\circ\text{C}$. With the help of stopper and key, the fat level was adjusted in such a way that scale reading corresponds to the lowest point of the fat meniscus and the surface of separation of the fat and acid. The observed fat level was recorded as percent fat of test sample.

Protein

Micro-kjeldahl method was followed for determination of protein content of colostrum. Micro-kjeldahl distillation apparatus was used for distillation of digested sample. About two grams of colostrum sample in duplicate were taken in kjeldahl flask and digested with 20 ml of concentrated sulphuric acid. A small amount of digestion mixture (sodium sulphate and copper sulphate in the ratio of 95:5) was added to aid digestion. After all the contents were digested, the digested samples were transferred to 250 ml volumetric flask and the volume was made up to the mark, with rinsing of kjeldahl flask, with distilled water. From the volume of 250 ml, 10 ml was taken into micro-kjeldahl assembly along with the 10 ml of 40 per cent sodium hydroxide for distillation. Upon distillation the ammonia was liberated which was collected in 4 per cent boric acid solution. The titration of the collected ammonia was carried out against N/50 sulphuric acid to get amount of nitrogen present in the sample.

Calculation

$$\text{Per cent protein (g protein/100 gm of sample)} = \frac{B \times 0.00028 \times 250 \times 100 \times 6.38}{W \times V}$$

Where,

B	burette reading of N/ 50 sulphuric acid
250	volume of aliquot
W	weight of sample
V	volume of aliquot used for distillation
6.38	Empirical factor (for milk protein)
0.00028	factor for N/50 sulphuric acid used

Ash

For determination of ash about 10 ml of colostrum samples in duplicate were accurately weighed on electronic balance, corrected upto 0.1 mg, in dried and preweighed crucibles and kept in hot air oven at $102 \pm 1^\circ\text{C}$ for 4 hours. The sample in the crucible was subjected to carbonization followed by incineration of the sample by placing the crucible in muffle furnace at 550°C - 600°C for about 2 hours.



Calculation

$$\text{Ash per cent} = [(W1 - W2) / W2 - W] \times 100$$

Where,

W = weight of empty dried crucible (g)

W1 = weight of crucible + sample after ashing (g)

W2 = weight of sample (g)

Lactose

Lane-Eynon Oxidation–Reduction Reaction method was followed for determination of lactose content of colostrum samples. About 25 ml of colostrum was taken in a 500 ml conical flask and diluted with distilled water to about 200 ml. About 3.75 ml of 10 per cent acetic acid solution were added to it and then subjected to boiling. On cooling, it was transferred quantitatively to a 250 ml volumetric flask and the volume was made up to mark with distilled water. It was then filtered through a filter paper and the filtrate was collected in a dry conical flask. The burette was filled with this filtrate. 5 ml of each of Fehling solution A and B were pipetted into 250 ml of conical flask and preliminary titration was made by adding the filtrate containing lactose, from the burette, 1 ml at a time, to the Fehling solution kept boiling till the blue colour changes to red. About 5 drops of methylene blue indicator were added to the boiling mixture and titration was completed within a total boiling time of 3 minutes by additions of 4 to 6 drops of the filtrate till end point was reached indicated by the change of blue colour to colourless supernatant.

Calculation

$$\text{Lactose (\%)} = W/V \times 250 \times 100/25 \times 1/1000$$

Where,

V = Volume of filtrate required for complete reduction of 10 ml of Fehling solution

W = Lactose equivalent in mg for V ml

Microbiological Analysis

The colostrum samples were collected in sterile containers and bought under hygienic conditions to the laboratory of Division of LPT, F. V. Sc. and A. H., SKUAST-K, were subjected to microbiological analysis for total plate count using standard plate count technique as per APHA (2004).

Sample Preparation and Serial Dilution

About 10ml of colostrum was aseptically transferred to a pre-sterilized volumetric flask and 90ml of peptone water was added to it to get solution of 10^{-1} dilution. About 1ml of this diluted solution was transferred to another tube containing 9ml of sterile 0.1 percent peptone water (peptone from Qualigens Fine Chemicals) to get 10^{-2} dilution. This procedure was repeated to obtain 10^{-3} dilution and so on, until appropriate dilution was achieved which yielded plates with 25 to 250 colony forming units (cfu). All the



procedures were performed in the sterilized environmental conditions of laminar air flow (NSW-201 Horizontal Laminar Flow cabinet).

Total Plate Count

For determination of TPC, total plate count agar (Hi-Media Laboratories, Pvt. Ltd., Mumbai) was used. About 17.5g of it was dissolved in 1000ml of distilled water followed by sterilization in an autoclave at 15 lb pressure (121°C) for 15 minutes and cooled to remain at 45°C. With the help of sterile pipette serial dilutions of sample were made and 1ml from each test tube was inoculated into a double set of pre-sterilized petridishes. Pour plate technique were followed for plating. The inoculum and media in petridishes were mixed thoroughly and uniformly by rotating the plates alternatively in clockwise and anticlockwise directions followed by back and forth motion on level surface. When media in plates solidified, they were inverted and incubated aerobically at 35±1°C for 24±3 hours. The number of micro-organisms per ml of sample was calculated by selecting plates containing 25 to 250 cfu/ml or selecting plates with count closest to this range. The cfu/ml was calculated by using the formula:

$$N = \sum C / [(1 \times n_1) + (0.1 \times n_2)]d$$

Where,

N = number of colonies per milliliter of product

∑C = sum of all colonies on all plates counted

n₁ = number of plates in lower dilution counted

n₂ = number of plates in next higher dilution counted

d = dilution from which the first counts were obtained

Finally, the cfu/ml was expressed as log₁₀ cfu/ml of sample

Statistical Analysis

The data obtained from duplicate samples were averaged and the data so generated were analyzed statistically following the method of Snedecor and Cochran (1980), Gomez and Gomez (1984) and Steel and Torrie (1984). The data was processed in a computer using SPSS software package. The analysis of variance of group mean was computed and significance of means tested by using Least Significant Difference test at 5 per cent level of significance. Two way analysis of variance with all possible interactions was carried out. The nested means were compared when the interaction was found to be significant. In the absence of such significance the overall means were compared.

Results and Discussion

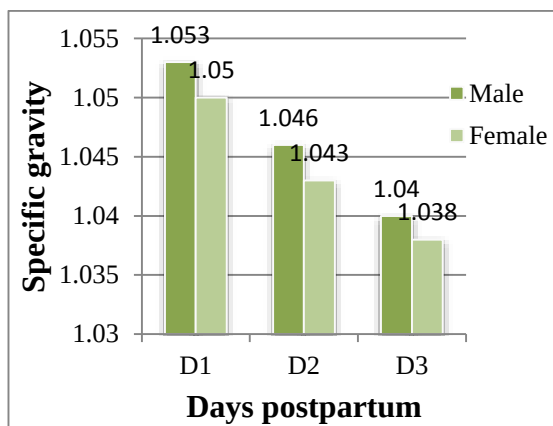
The effect of the sex of new born during transition period on various physico-chemical, compositional and microbiological characteristics of bovine colostrum is exhibited in Table 1 and graphically illustrated in Figs. 1 and 2.

Table 1: Effect of the sex of new born during various stages of transition period on various physicochemical, compositional and microbiological characteristics of bovine colostrum (Mean $\pm$ SE.)

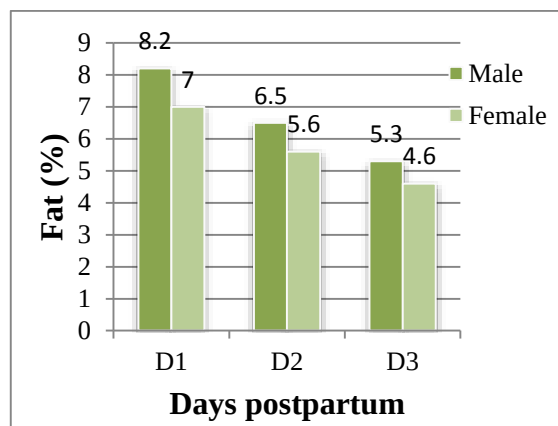
Days Post-Partum	Sex of New Born		Overall mean
	Male	Female	
Specific gravity			
D1	1.053±0.002	1.050±0.003	1.052±0.002 ¹
D2	1.046±0.002	1.043±0.002	1.044±0.001 ²
D3	1.040±0.001	1.038±0.001	1.039±0.001 ³
Overall mean	1.046±0.001 ^a	1.044±0.001 ^b	1.045±0.001
Fat (%)			
D1	8.2±0.32	7.0±0.41	7.6±0.28 ¹
D2	6.5±0.26	5.6±0.28	6.0±0.20 ²
D3	5.3±0.22	4.6±0.19	4.9±0.15 ³
Overall mean	6.7±0.23 ^a	5.7±0.22 ^b	6.2±0.17
Total protein (%)			
D1	12.6±0.55	10.6±0.72	11.6±0.48 ¹
D2	9.7±0.45	8.5±0.54	9.1±0.36 ²
D3	7.7±0.24	6.9±0.34	7.3±0.22 ³
Overall mean	10.0±0.38 ^a	8.7±0.38 ^b	9.3±0.28
Casein protein (%)			
D1	3.6±0.20	3.1±0.23	3.3±0.16 ¹
D2	7.3±0.33	6.5±0.40	6.9±0.26 ²
D3	5.9±0.18	5.4±0.27	5.6±0.16 ³
Overall mean	5.6±0.26 ^a	5.0±0.27 ^b	5.3±0.19
Whey protein (%)			
D1	9.0±0.39	7.6±0.54	8.2±0.35 ¹
D2	2.4±0.16	2.0±0.15	2.2±0.11 ²
D3	1.9±0.08	1.6±0.07	1.7±0.06 ²
Overall mean	4.4±0.49 ^a	3.7±0.43 ^b	4.1±0.32
Lactose (%)			
D1	2.8±0.04	2.7±0.04	2.7±0.03 ¹
D2	3.5±0.06	3.2±0.09	3.4±0.06 ²
D3	3.9±0.07	3.6±0.11	3.8±0.07 ³
Overall mean	3.4±0.08 ^a	3.2±0.07 ^b	3.3±0.05
Total solids (%)			
D1	26.6±0.91	23.5±1.1	25.0±0.75 ¹
D2	21.5±0.65	19.5±0.83	20.5±0.56 ²
D3	18.5±0.42	16.8±0.60	17.6±0.40 ³
Overall mean	22.2±0.62 ^a	19.9±0.62 ^b	21.0±0.45
Solids not fat (%)			
D1	18.4±0.68	16.4±0.73	17.4±0.52 ¹
D2	15.0±0.47	13.9±0.60	14.4±0.39 ²
D3	13.2±0.31	12.2±0.47	12.6±0.29 ³
Overall mean	15.5±0.43 ^a	14.1±0.42 ^b	14.8±0.31
Ash (%)			
D1	1.2±0.11	1.1±0.06	1.14±0.06 ¹
D2	0.91±0.02	0.87±0.03	0.88±0.02 ²
D3	0.80±0.02	0.78±0.02	0.79±0.01 ²
Overall mean	0.98±0.04 ^a	0.90±0.03 ^a	0.94±0.03
pH			
D1	6.38±0.02	6.37±0.02	6.38±0.01 ¹
D2	6.46±0.02	6.44±0.02	6.45±0.01 ²
D3	6.53±0.02	6.53±0.02	6.5±0.02 ³
Overall mean	6.45±0.01 ^a	6.45±0.01 ^a	6.45±0.01
Electrical conductivity (mScm ⁻¹)			
D1	5.8±0.17	5.4±0.12	5.6±0.10 ¹
D2	5.0±0.18	4.6±0.15	4.8±0.12 ²



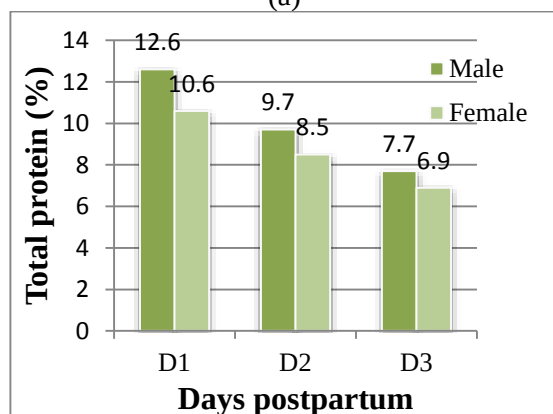
D3	4.3±0.12	4.2±0.11	4.3±0.08 ³
Overall mean	5.0±0.12^a	4.7±0.10^b	4.9±0.08
Total plate count (log₁₀cfu/ml)			
D1	4.7±0.05	4.6±0.04	4.6±0.03 ¹
D2	4.8±0.04	4.7±0.03	4.8±0.02 ²
D3	4.9±0.04	4.8±0.03	4.9±0.02 ³
Overall mean	4.8±0.03^a	4.7±0.02^a	4.8±0.02



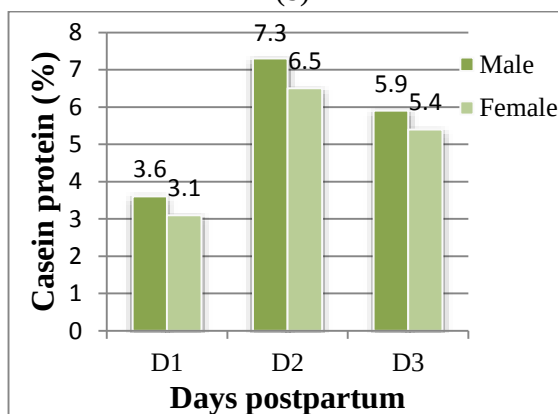
(a)



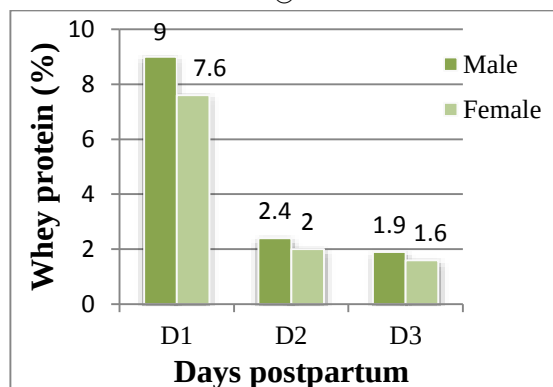
(b)



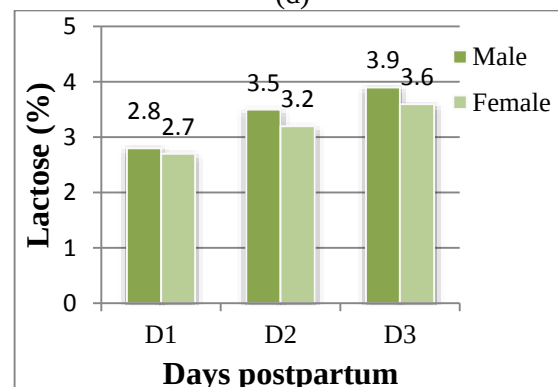
(c)



(d)



(e)



(f)

Fig. 1: Effect of the sex of new born during various days of transition period on specific gravity (a), fat (b), total protein (c), casein protein (d), whey protein (e) and lactose (f) of bovine colostrum

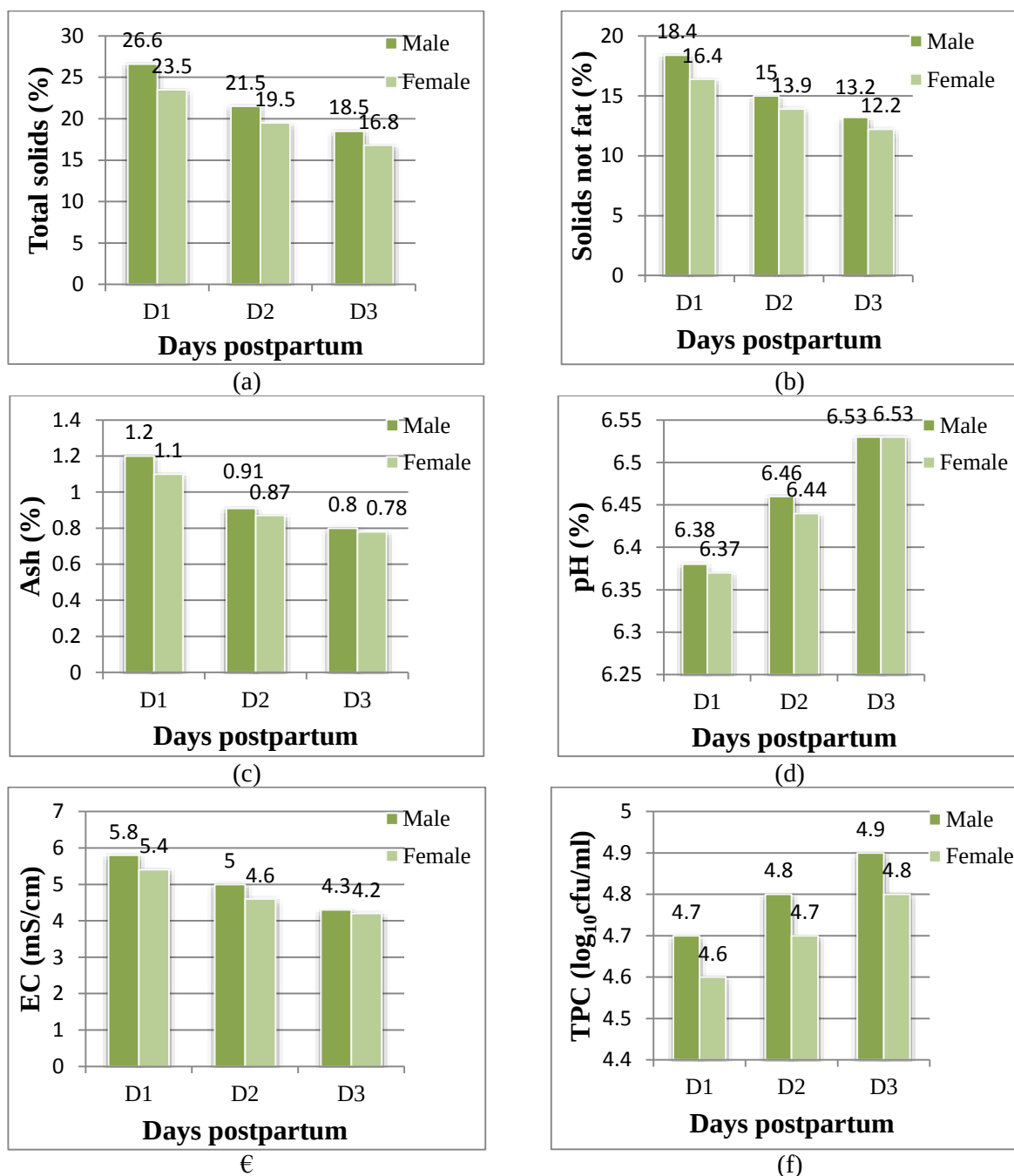


Fig. 2: Effect of the sex of new born during various days of transition period on total solids (a), solids not fat (b), ash (c), pH (d), electrical conductivity (e) and total plate count (f) of bovine colostrum

While comparing the values with respect to the specific gravity of colostrum samples it was seen that the specific gravity at all the three days post-partum under study differed significantly from one another with values at day 1 being highest followed by day 2 and day 3 irrespective of the sex of new born. The results agree favourably with those of Foley and Otterby (1978), Quigley III *et al.* (1994), Morin *et al.* (2001) and Sobczuk-Szul *et al.* (2013). Keeping aside the days of transition, the animals that had delivered a male new



born had significantly ($p \leq 0.05$) higher specific gravity compared to the animals that delivered the female offspring. The fat content of the colostrum samples during various periods postpartum showed a declining trend with values being significantly ($p \leq 0.05$) different from one another irrespective of the sex of new born. The values are close to the values reported by Foley and Otterby (1978), Klimes *et al.* (1986) and Raducan *et al.* (2013). The fat content of the colostrum obtained from the animals that gave birth to male offspring was significantly ($p \leq 0.05$) higher than those animals that gave birth to female offspring. Total protein content of the colostrum during the transition period postpartum declined progressively with values at each day under study being significantly ($p \leq 0.05$) different from one another. Similar results are reported by Foley and Otterby (1978), Klimes *et al.* (1986), Elfstrand *et al.* (2002) and Raducan *et al.* (2013). Without taking into consideration the days of transition, the total protein content of colostrum samples obtained from the animals that brought forth male calves was significantly ($p \leq 0.05$) higher than those animals that brought forth female calves. Upon investigating the casein protein values of the colostrum samples, it was revealed that the casein protein values on day 1 were significantly ($p \leq 0.05$) lower than day 2 and day 3 while the values at day 2 were significantly ($p \leq 0.05$) higher than day 3. Similar trend was reported by Benheng and Chengxiang (1996). Without taking into contemplation the days of transition, the casein content of the colostrum samples obtained from the animals that had delivered a male new born was significantly ($p \leq 0.05$) higher compared to the animals that delivered the female offspring. The whey protein content of the colostrum samples during various periods postpartum showed a declining trend with the values at day 1 being significantly ($p \leq 0.05$) higher compared to either day 2 or day 3 which within themselves were comparable. These results corroborate the findings of Klimes *et al.* (1986) and Benheng and Chengxiang (1996).

As far as the whey protein values of the colostrum samples obtained from the animals that brought forth male calves is concerned, it was significantly ($p \leq 0.05$) higher than those animals that brought forth female calves. Lactose, conversely went on increasing with each passing day post-partum having lowest value at day 1 and highest at day 3 postpartum, all the three values were significantly ($p \leq 0.05$) different from each other. These results are in agreement with the findings of Foley and Otterby (1978), Benheng and Chengxiang (1996), Elfstrand *et al.* (2002) and Kleinsmith (2011). Irrespective of the days of transition, the lactose content of colostrum samples obtained from the animals that had delivered a male new born was significantly ($p \leq 0.05$) higher compared to the animals that delivered the female offspring. Total solids content of the colostrum samples during various periods postpartum showed a diminishing trend with values being significantly ($p \leq 0.05$) different from one another irrespective of the sex of new born. Similar trend has been reported by Foley and Otterby (1978), Klimes *et al.* (1986) and Raducan *et al.* (2013). As far as the total solids value of the colostrum samples obtained from the animals that brought forth male calves is concerned, it was significantly ($p \leq 0.05$) higher than those animals that brought forth female calves.



Regardless of the sex of new born, the day 1 postpartum colostrum samples had significantly ($p \leq 0.05$) higher solids not fat than day 2 and day 3 colostrum samples and between the latter two samples, the day 2 samples had significantly ($p \leq 0.05$) higher solids not fat compared to day 3 samples thereby flaunting a clear cut trend of transition from a higher solids not fat towards normally lower solids not fat as the transition period passes on. Similar trend has been reported by Raducan *et al.* (2013). Without regard to the days of transition, the sex of the new born had significant effect on the solids not fat of the colostrum in that the colostrum samples obtained from the animals that had delivered a male new born had significantly ($p \leq 0.05$) higher solids not fat compared to the animals that delivered the female offspring. Without taking the sex of new born into consideration, the day 1 postpartum colostrum samples had significantly ($p \leq 0.05$) higher ash content than day 2 and day 3 colostrum samples which within themselves possessed comparable ash content. Similar findings have been reported by Klimes *et al.* (1986) and Tsioulpas *et al.* (2007). Without regard to the days of transition the sex of the new born had no significant ($p > 0.05$) effect on the ash content of the colostrum samples. pH of the colostrum samples under study increased significantly ($p \leq 0.05$) with every passing day post-partum upto day 3 post-partum. The day 1 postpartum colostrum samples had significantly ($p \leq 0.05$) lower pH value than day 2 and day 3 colostrum samples and between the latter two samples, the day 2 samples had significantly ($p \leq 0.05$) lower pH values compared to day 3 samples. Similar increase has been reported by Klimes *et al.* (1986) and Elfstrand *et al.* (2002). Irrespective of the days of transition the sex of the new born had no significant ($p > 0.05$) effect on the pH value of the colostrum samples. Keeping aside the sex of new born, the day 1 postpartum colostrum samples had significantly ($p \leq 0.05$) higher values of electrical conductivity than day 2 and day 3 colostrum samples and between the latter two samples, the day 2 samples had significantly ($p \leq 0.05$) higher value compared to day 3 samples. The results at day 1 uphold the findings of Raimondo *et al.* (2009) and Bar *et al.* (2010). Irrespective of the days of transition the electrical conductivity of the colostrum samples obtained from the animals that gave birth to male offspring was significantly ($p \leq 0.05$) higher than those animals that gave birth to female offspring. Total plate count (TPC) of the colostrum samples showed an increasing trend with the passage of post-partum period with values being significantly ($p \leq 0.05$) lower at day 1 followed by a significant ($p \leq 0.05$) increase at day 2 and further significant ($p \leq 0.05$) increase at day 3. The findings are close to the findings of Morill *et al.* (2012). Without regard to the days of transition, the sex of the new born had no significant effect on the total plate count of the colostrum, the colostrum samples obtained from the animals that delivered a male new born had TPC values comparable to the animals that delivered the female offspring. The reason for higher content of major components in the colostrum samples obtained from the animals that delivered a male new born could possibly be the natures provision for providing adequate nutrients to the male new born which is invariably having higher weight and lower resistance to diseases compared to female newborn (Naqvi and Shami, 1999; Tiwari *et al.*, 2007; Mushtaq *et al.*, 2013).



Conclusion

The animals which gave birth to the male offspring had higher values for various physico-chemical, compositional and microbiological characteristics than the animals which brought forth female offspring.

Acknowledgement

I am highly thankful to my Advisor and whole staff of Division of LPT, F.V.Sc. & A. H. Shuhama, SKUAST-K for being with me during my research.

References

1. Bar E, Tiris I, Sarbu D, Iridon C, Cchea I and Bratu I. 2010. Full characterization of bovine colostrum, raw material for dietary supplements, its beneficial effect on the human immune system. *Food Technology*. 12: 63-67.
2. BenHeng G. and ChengXiang L. 1996. Chemical composition of bovine colostrum. *Journal of Northeast Agricultural University*. 3(1): 72-77.
3. Cairangzhuoma, Yamamoto M, Muranishi H, Inagaki M, Uchida K, Yamashita K, Saito S, Yabe T. and Kanamaru Y. 2013. Skimmed, sterilized, and concentrated bovine late colostrum promotes both prevention and recovery from intestinal tissue damage in mice. *Journal of Dairy Science*. 96(3): 1347-1355.
4. Elfstrand L, Lindmark-Mansson H, Paulsson M, Nyberg L. and Akesson B. 2002. Immunoglobulins, growth factors and growth hormone in bovine colostrum and the effects of processing. *International Dairy Journal*. 12: 879-887.
5. Foley JA & Otterby DE. 1978. Availability, storage, treatment, composition, and feeding value of surplus colostrum: a review. *Journal of Dairy Science*. 61: 1033-1060.
6. Houser BA, Donaldson SC, Kehoe SI, Heinrichs AJ and Jayarao BM. (2008). A Survey of Bacteriological Quality and the Occurrence of *Salmonella* in Raw Bovine Colostrum. *Foodborne Pathogens and Disease*. 5(6): 853-858.
7. Kleinsmith A. 2011. Scientific and medical research related to bovine colostrum, its relationship and use in the treatment of disease in humans selected published abstracts. True bovine colostrum for the practitioner. Internet: downloaded from <http://www.healthyhabitsusa.com/pdfs/colustrum.pdf>.
8. Klimes J, Jagos P, Houda J and Gajdusek S. 1986. Basic qualitative parameters of cow colostrum and their dependence on season and post partum time. *Acta vet. Brno*. 55: 23-39.
9. Levieux D and Ollier A. 1999. Bovine immunoglobulin G, beta-lactoglobulin, alpha-lactalbumin and serum albumin in colostrum and milk during the early post partum period. *Journal of Dairy Research*. 66: 421-430.
10. Li H and Aluko RE. 2006. Bovine colostrum as a bioactive product against human microbial infections and gastrointestinal disorders. *Current Topics in Nutraceutical Research*. 4: 227 – 237.
11. Morin DE, Constable PD, Maunsell FP and McCoy GC. 2001. Factors associated with colostral specific gravity in dairy cows. *Journal of Dairy Science*. 84: 937-943.
12. Morrill KM, Conrad E, Lago A, Campbell J, Quigley J and Tyler H. 2012. Nationwide evaluation of quality and composition of colostrum on dairy farms in the United States. *Journal of dairy sciences*. 95: 3997-4005.
13. Mushtaq MH, Saleem MN, Ayyub RM and Khattak I. 2013. Challenges due to early calf mortality in dairy industry of Pakistan and strategies for improvement. *Veterinaria*. 1: 13-17.
14. Naqvi A and Shami SA. 1999. Factors affecting birth weight in nili-ravi buffalo calves. *Pakistan vet. Journal*. 19(3): 119-122.
15. Quigley III JD, Martin KR, Dowlen HH, Wallis LB and Lamar K. 1994. Immunoglobulin concentration, specific gravity, and nitrogen fractions of colostrum from jersey cattle. *Journal of dairy sciences*. 77: 264-269.



16. Raducan GG, Acatincai S, Czisztter LT, Tripon I and Baul S. 2013. Contributions to the Knowledge of Chemical Composition Evolution in Colostral Milk. *Animal Science and Biotechnologies*. 46(2): 322-324.
17. Sobczuk-Szul M, Wielgosz-Groth Z, Wroński M and Rzemieniewski A. 2013. Changes in the bioactive protein concentrations in the bovine colostrum of Jersey and Polish Holstein–Friesian cows. *Turkish Journal of Veterinary and Animal Sciences*. 37: 43-49.
18. Tiwari R, Sharma MC & Sing B P. 2007. Buffalo calf health care in commercial dairy farms; a field study in U.P. *Livestock Research in rural development*. 19: 3.
19. Tsioulpas A, Grandison AS and Lewis MJ. 2007. Changes in physical properties of bovine milk from the colostrum period to early lactation. *Journal of Dairy Science*. 90: 5012-5017.
20. Wilson J. 1997. Immune system breakthrough: Colostrum. *Journal of Longevity Research*. 3: 7–10.

