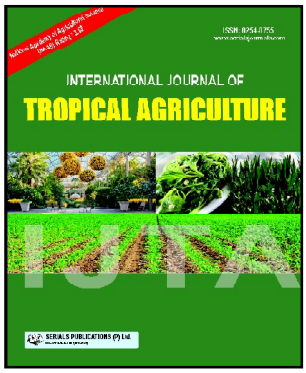

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Comparative Study Saturated Fattyacids Profile of milk in Gir and itscrosses

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INTRODUCTION

Cow milk fat typically contains 70 % saturated fatty acids (SFA), 25 % mono unsaturated fatty acids (MUFA), and 5% polyunsaturated fatty acids (PUFA); (Grummer, 1991). A milk lipid composition more favorable to human health would be about 30 % SFA (Pascal, 1996), 60 % MUFA, and 10 % PUFA (Hayes and Khosla, 1992).

The milk fatty acids are derived almost equally from two sources, the feed and the microbial activity in the rumen of the cow (Parodi, 2004). The fatty acid synthesizing system in the mammary gland of the cow produces fatty acids with even number of carbons of 4-16 carbons in length and accounts for approximately 60 and 45 per cent of the fatty acids on a molar and weight basis, respectively (McGuire and Banman, 2003). This de novo synthesis in the mammary gland is of the 4:0-14:0 acids together with about half of the 16:0 from acetate and ?-hydroxybutyrate. Acetate and butyric acid are generated in the rumen by fermentation of feed components. The butyric acid is converted to ?-hydroxybutyrate during absorption through the rumen epithelium. Bovine fat contains certain fatty acids with odd number of carbons, such as pentadecanoic acid (15:0) and heptadecanoic acid (17:0). These two fatty acids are synthesized by the bacterial flora in the rumen (German and Dillard, 2006). The remaining 16:0 and the long- chain fatty acids originate from dietary lipids and from lipolysis ofadipose tissue triacylglycerols (Parodi, 2004). Medium and long chain fatty acids, but mainly 18:0, may be desaturated in the mammary gland to form the corresponding monosaturatedacids. In view of this the research work is planned on **"Comparative study Saturated fatty acids. Profile of milk in Gir and itscrosses"**

MATERIAL AND METHODS

This investigation was carried out in the laboratories of the Department of Animal Husbandry and Dairy Science utilizing the facilities from the Department of Agriculture Chemistry and Soil Science, Post

Gradaute Institute and Department of Food Processing Engineering, Dr. AnnasahebShinde, College of Agriculture Engineering, M.P.K.V., Rahuri (M.S.). The experiments were conducted during the year2013-14.

SELECTION OF COWS

For the present investigation, 12 Gir, 12 of Gir half breed (GHB) and 12 of Phule Triveni group cows were selected on their 1st (7-30 days), 2nd (31-60 days), 3rd (61-150 days) and 4th(151-270 days) lactation stages from theResearch-cum- Development Project, (RCDP) oncattle.

These cows were divided into 3 groups according their breeds as detailed below.

1. Breed first(Gir)
2. Breed second (Gir halfbreed)
3. Phule Triveni(PT)

The cows under each breed were further grouped according to the stage of lactation,as given below.

1. Between 07 to 30 days(SL_1)
2. Between 31 to 60 days(SL_2)
3. Between 61 to 150 days(SL_3)
4. Between 151 to 270 days(SL_4)

MILKSAMPLES

Fresh composite milk samples of Gir and it's cross breeds as per stage of lactation were collected from Research Cum Development Project on Cattle at 7 days interval and preserved in deep freeze till the analysis was completed. At a time, 1 liter of each milk sample was collected and analyzed.

SPECTRA ALYZER

Spectra Alyzer ZEUTEC (Germany Company) i.e. NIR Analyzer based on principle of "Sample and Reference" measurement was been used for determination of fatty acid profile in milk. In this method first we had to standardize the 30 milk samples by incorporating the reference from the literature. Then after machine has been standardize the samples were put one by one in machine. Than for calibration time taken was 1 minute then main reading was displayed on the computer foranalysis.

STATISTICALANALYSIS

Factorial Randomized Block Design was adopted to study the effect of breed and stage of lactation on physico-chemical, mineral and fatty acid profile of the milk of Gir and its crossbred cows (Snedecor and Cochran, 1967).

RESULT AND DISCUSSION

Saturated fattyacids

1. Butyric acid(C4:0): From the Table 1 it is revealed that breed and stage of lactation influenced significantly the C4:0 content in the milk. The mean values were 8.00, 7.70, 5.76 and 4.32 per cent in the milk from 1st, 2nd, 3rd and 4th stage of lactation, respectively.

Table 1
Butyric acid (C4:0) content of milk as affected by breed and stage of lactation

Factors	*Gif*	*Half-bred*	*Phule Triveni*	*Mean*
	← % of total identifiable fatty acids →			
SL_1	7.50	8.20	8.30	8.00^d
SL_2	7.45	7.55	8.10	7.70^c
SL_3	5.25	5.86	6.16	5.76^b
SL_4	3.85	4.46	4.66	4.32^a
	S.E.		CD at 5%	
Breed	0.023		0.067	
SL	0.020		0.058	
Breed × SI.	**0.040**		**0.115**	

Each value is a mean of three replications

However, the values range from 3.85 to 8.30 per cent with an overall means of 6.45 percent.

Amongst the breeds Phule Triveni had significantly higher butyric acid (6.81%) followed by Gir half-bred (6.52 %) and Gir (6.01 %).

2. Caproic acid (C6:0): From the data (Table 2) it is seen that the mean C6:0 content was 3.93, 3.62, 3.42 and 2.92 for the 1st, 2nd, 3rd and 4th stages of lactation, respectively. Further, it was noticed that higher C6:0 content was observed in the Phule Triveni (3.81%) followed by Gir half-bred (3.65%) and Gir (2.95 %). However, breed and its interaction with stage of lactation did not affect the C6:0 significantly. The milk samples showed a minimum 2.40 per cent and the maximum level of 4.30 percent of C 6:0 atvarious stages of the experimentation.

Table 2
Caproic acid (C6:0) content of milk as affected by breed and stage of lactation

Factors	*Gir*	*Half-bred*	*Phule Triveni*	*Mean*
	← % of total identifiable fatty acid →			
SL_1	**3.40**	4.10	4.30	3.93^{d}
SL_2	3.10	**3.80**	3.95	3.62^{c}
SL_3	**2.90**	**3.60**	3.75	3.42^{b}
SL_4	**2.40**	3.10	3.25	2.92^{a}
Mean	**2.95^{a}**	**3.65^{b}**	3.81^{c}	3.47
	S.E.		CD at 5%	
Breed	**0.025**		0.072	
SL	0.021		0.062	
Breed x SL	0.043		N.S.	

Each value is a mean of three replications

3. Caprylic acid(C8:0): From the Table 3 it may be observed that overall mean for C8:0 contained 2.62 per cent. The C8:0 content wassignificantly influenced due to thestage of lactation.

However, the breed and its interaction with stage of lactation did not affect C8:0, significantly. The C8:0 per centage in the milk of Gir, Gir half-bred and Phule Triveni was highest during the 1st stage of lactation which showed decreasing trends 2nd (2.50%) stage followed by 3rd and 4th lactation (2.45 and 2.39), respectively.

Amongst the breeds, higher values were bserved in Phule Triveni (2.94 %) followed by Sir half-bred (2.80 %) and Gir(2.11%).

Table 3: Caprylic acid (C8:0) content of milk as effected by breed and stage of lactation

Factors	*Gir*	*Half-bred*	*Phule Triveni*	*Mean*
	← % of total identifiable fatty acids →			
SL_1	2.60	3.30	3.50	3.13^{ab}
SL_2	2.00	2.70	2.80	2.50^{ab}
SL_3	1.95	2.64	2.77	2.45^{a}
SL_4	1.90	2.57	2.70	2.39^{a}
Mean	2.11^{a}	2.80^{b}	2.94^{C}	2.62
	S.E.+		CD at 5%	
Breed	0.027		0.079	
SL	0.023		0.069	
Breed x SL	0.047		N.S.	

Each value is a mean of three replications

4. Capric acid (C10:0): From the present investigation Table 4 it is seen that the overall mean for C10:0 content was 3.25 per cent. The differences in the (C10:0) content due to stage of lactation. were significant ($P<0.05$). The mean (C10:0) percentage was 4.42,2.99,2.87 and 2.72 in 1st, 2nd, 3rd and 4thstage of lactation, respectively. Amongst the breeds Gir (3.71 %) showed significantly higher values followed by Phule Triveni (3.04) and Gir half-bred (3.01). It was further observed that the interaction between breed and stage of lactation showed non- significant effect on C10:0 content inmilk.

Table 4
Capric acid (C10:0) content of milk as affected bybreed and stage of lactation

Factors	*Gir*	*Half-bred*	*Phule Triveni*	*Mean*
	% of total identifiable fatty acids			
SL_1	4.88	4.18	4.20	4.42[d]
SL_2	3.45	2.75	2.78	2.99[c]
SL_3	3.33	2.63	2.66	2.87[b]
SL_4	3.18	2.48	2.51	2.72[a]
Mean	3.71b	3.01a	3.04a	3.25
	S.E. +		CD at 5%	
Breed	0.017		0.049	
SL	0.015		0.043	
Breed x SL	0.029		N.S.	

Each value is a mean of three replications

5. Lauric acid (C12:0): The overall mean for C12:0 was 4.00 per cent. The stage of lactation significantly affected the C12:0 content of the milk.

The minimum C12:0 values in the milk was found in 1st stage of lactation of Gir, Gir half-bred and Phule Triveni (1.95, 2.25 and 2.30%) which increased gradually and reached to maximum value (4.55, 5.25 and 5.30%) in the 4th stage of lactation, respectively.

Table 5
Lauric acid (C12:0) content of milk as affected bybreed and stage of lactation

Factors	*Gir*	*Half-bred*	*Phule Triveni*	*Mean*
	% of total identifiable fatty acids			
SL_1	1.95	2.25	2.30	2.17[a]
SL_2	4.15	3.85	4.88	4.29[b]
SL_3	4.35	4.05	5.10	4.50[c]
SL_4	4.55	5.25	5.30	5.03[d]
Mean	3.75[a]	3.85[b]	4.40[c]	4.00
	S.E. +		CD at 5%	
Breed	0.029		0.085	
SL	0.025		0.073	
Breed x SL	0.050		0.146	

Each value is a mean of three replications

The mean content of C12:0 was noticed to be 2.17, 4.29, 4.50 and 5.03 % during 1st, 2nd, 3rd and 4th stage of lactation, respectively. It showed increasing trend with advancing stage of lactation.

5. Myristic acid (C14:0): From given data in Table 5 it is seen that the mean C14:0 content was 14.26 per cent and ranged from 12.40 to 16.00 percent in the milk sample sunder study.

Table 5
Myristic acid (C14:0) content of milk as affected by breed and stage of lactation

Factors	*Gir*	*Half-bred*	*Phule Triveni*	*Mean*
	% of total identifiable fatty acid			
SL_1	15.20	15.84	16.00	15.68[d]
SL_2	12.40	12.90	13.40	12.90[a]
SL_3	13.75	13.47	14.76	13.99[b]
SL_4	13.80	14.90	15.09	14.60[c]
Mean	13.79[a]	14.28[b]	14.81[c]	14.26
	S.E.+		CD at 5%	
Breed	0.020		0.060	
SL	0.018		0.052	
Breed x SL	0.035		0.103	

Each value is a mean of three replications

The C14:0 content in the milk was highest during the 1st stage of lactation and lowest in 2nd stage of lactation However, the breed and its interaction with stage of lactation affected c14:0 content significantly with eachother.

Amongst the breeds, phuleTriveni (14.81%) showed higher values than Gir half-bred (14.28%) followed by Gir(13.79%).

6. Pentadecanoic acid (C15:0): Data in Table 6 reveal that overall mean for the C15:0 content was 0.17 per cent. However, C15:0 was not detected in Half-bred and PhuleTriveni. While in case of Gir, the mean C15:0 content was 0.51 percent.

Table 6
Pentadecanoicacid (C15:0) content of milk as affected by breed and stage of lactation

Factors	*Gir*	*Half-bred*	*Phule Triveni*	*Mean*
	% of total identifiable fatty acid			
SL_1	0.16	Nil	Nil	0.05[a]
SL_2	0.16	Nil	Nil	0.05[a]
SL_3	0.16	Nil	Nil	0.05[a]
SL_4	1.58	Nil	Nil	0.53[b]
Mean	0.51[b]	Nil	Nil	0.17
	S.E.+		CD at 5%	
Breed	0.003		0.009	
SL	0.003		0.008	
Breed x SL	0.006		0.016	

Each value is a mean of three replications

7. Palmitic acid (C16:0): The Maximum C16:0 values were observed in 1st stage of lactation (25.37, 25.04 and 25.32%) which gradually decreased to (22.4, 2208 and 23.17%) in the 4th stage of lactation. The mean (C16:0) values were 25.24, 25.14, 24.22 and 22.55 per cent during 1st, 2nd, 3rd and 4th stage of lactation, respectively.

Table 7
Palmitic acid (C16:0) content of milk as affected bybreed and stage of lactation

Factors	*Gir*	*Half-bred*	*Phule Triveni*	*Mean*
	% of total identifiable fatty acids			
SL_1	25.37	25.04	25.32	25.24[d]
SL_2	24.74	25.41	25.28	25.14[c]
SL_3	23.74	24.42	24.51	24.22[b]
SL_4	22.40	22.08	23.17	22.55[a]
Mean	24.06[a]	24.24[b]	24.57[c]	24.29
	S.E. +		CD at 5%	
Breed	0.023		0.066	
SL	0.020		0.057	
Breed x SL	0.039		0.114	

Each value is a mean of three replications

It was also observed that the breed and its interaction with stage of lactation affected the (C16:0) values in the milk. Among the breeds Phule Triveni (24.57 %) showed significantly higher values followed by Gir half-bred (24.24 %) and Gir (24.06%).

8. Stearic acid (C18:0): A perusal of Table 8 indicate that overall C18:0 content was 11.94 per cent. The C18:0 content was significantly influenced by the stage of lactation. The stage of lactation had a significant influence on the C18:0 content. The range for stearic acid varied from 9.50 to 13.50 percent.

Amongst breeds stearic acid content was higher in half-breds (12.38 %) followed by Phule Triveni (11.78 %) and Gir (11.68%).

Table 8
Stearic acid (C18:0) content of milk as affected by breed and stage of lactation

Factors	*Gir*	*Half-bred*	*Phule Triveni*	*Mean*
	% of total identifiable fatty acid			
SL_1	9.50	10.20	10.24	9.98[a]
SL_2	12.00	12.70	11.74	12.15[b]
SL_3	12.40	13.10	12.01	12.50[c]
SL_4	12.80	13.50	13.11	13.14[d]
Mean	11.68[a]	12.38[c]	11.78[b]	11.94
	S.E.+		CD at 5%	
Breed	0.043		0.125	
SL	0.037		0.108	
Breed x SL	0.074		0.216	

Each value is a mean of three replications

9. Heneicosanoic acid (C21:0): The overall mean for C21:0 was 0.18 per cent (Table 9). The stage of lactation affected significantly the C21:0 content of milk. The minimum C21:0 content was observed in the 1st stage of lactation (0.02) which increased gradually in the 2nd lactation and thereafter remained constant upto the 4thstage of lactation.

Table 9
Heneicosanoicacid (C21:0) content of milk as affected by breed and stage of lactation

Factors	*Gir*	*Half-bred*	*Phule Tri veni*	*Mean*
	% of total identifiable fatty acid			
SL_1	0.07	Nil	Nil	0.02^b
SL_2	0.70	Nil	Nil	0.23^a
SL_3	0.70	Nil	Nil	0.23^a
SL_4	0.70	Nil	Nil	0.23^a
Mean	0.54b	Nil	Nil	0.18
	S.E. +		CD at 5%	
Breed	0.011		0.033	
SL	0.010		0.028	
Breed x SL	0.019		0.057	

Each value is a mean of three replications

In case of Phule Triveni and Half-bred heneicosanoic acid was not detected. However, the breed and interaction with the stage of lactation showed significant effect with each other.

10. Saturated fatty acids (SFA): From Table (10) it was observed that the mean valuesfor saturated fatty acid were 72.83, 71.58, 70.01 and 68.48 per cent in 1st, 2nd, 3rd and 4thstage of lactation, respectively. Overall the saturated fatty acid values ranged from 67.32 to 74.16 per cent with overall mean of 70.13 percent.

Table 10
Saturated fatty acid (SFA) content of milk as affected by breed and stage oflactation

Factors	*Gir*	*Half-bred*	*Phule Triveni*	*Mean*
	% of total identifiable fatty acid			
SL_1	71.23	73.11	74.16	72.83^d
SL_2	70.15	71.66	72.93	71.58^c
SL_3	68.53	69.77	71.72	70.01^b
SL_4	67.32	68.34	69.79	68.48^a
Mcan	69.31^a	70.72^b	72.15^c	70.73
	S.E.+		CD at 5%	
Breed	0.064		0.185	
SL	0.055		0.161	
Breed x SL	0.110		0.321	

Each value is a mean of three replications

Amongst the breeds Phule Triveni showed higher values of saturated fatty acids (72.15%) than Gir half-bred (70.72%) and Gir (69.81 %).

The present investigation shows that the values ofsaturated fatty acids in milk agree with those reported by Sharma et al. (2002) and Banerjee et al. (1991b).

CONCLUSION

The total saturated fatty acid are higher during the 1st stage of lactation followed by 2nd, 3rd and 4th stage of lactation. Amongst the Saturated fatty acid (Palmitic-24.57% of total fatty acids and stearic acid-11.78% of total fatty acids) are higher in PhuleTriveni cow milk than rest of two breed's milk which is essential to the controlled development of the brain inchildren.

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