Journal of Cell and Tissue Research Vol. 21(2): 7145-7148 (2021)
(Available online at www.tcrjournals.com)
ISSN: 0973-0028; E-ISSN: 0974-0910

Original Article

FATTY ACID PROFILE OF GHEE FROM INDIGENOUS BARGUR COWS IN COMPARISON WITH HOLSTEIN FRIESIAN CROSS BRED COWS

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Abstract: The Bargur cattle are the breed of draught cattle native to the Bargur hillock in Anthiyur Taluk of Erode District in Western Tamil Nadu in India. This study was planned to identify differences in fatty acid profile of ghee prepared from indigenous Bargur cow and Holstein Friesian crossbred cow. Six (6) numbers of 2nd to 3rd calving high milk producing CBargur cows were selected at early stage of lactation period (1-3 months) from BCRS, Bargur and six (6) numbers of 2nd to 3rd calving high milk producing Holstein Friesian crossbred cows were selected at early stage of lactation period (1-3 months) from private farmers at foot hill of Bargur (Anthiyur) for this study. Ghee samples prepared from these twelve (12) animals by indigenous method were analyzed for fatty acid profile. Results showed that Saturated fatty acid like palmitic acid (C16) was significantly higher (P<0.05) in indigenous Bargur cow, similarly unsaturated fatty acids like linolenic acid (C18:3) and palmitoleic acid (C16:1) were also significantly higher (P<0.01) in indigenous Bargur cow when compared with Holstein Friesian crossbred cow.

Keywords: Indigenous Bargur cow, Holstein Friesian croosbred cow, Ghee, Fatty acids

INTRODUCTION

At present, India has 192.49 million cattle of which 142.11 million are indigenous cattle and 50.42 million are exotic/crossbred cattle [1]. India is the largest milk producer (187.7 million tonnes in 2018-19) in the world [2]. It is estimated that about 50–55 % of milk produced in India is converted by the traditional

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sector into variety of Indian milk products [3].

Among the naturally occurring fats known, milk fat is one of the complex fat, containing more than 400 different fatty acids in its triglycerols [4]. However, in milk fat only a relative few of these are present in appreciable concentrations (C4:0 to C18:0) or are of nutritional significance [5].

The fatty acid composition of milk fat, which greatly influences the physico-chemical, functional and nutritive properties, is subjected to variation due to species, breed, stage of lactation and feed [6]. Similarly, Palmquist et al. [7] who mentioned that the fatty acid composition of milk fat is influenced by animal factors such as genetics, stage of lactation and as well as feed factors.

The main n-3 fatty acid in milk is alpha-linolenic acid (CLA) in majority of mammals and increased share of n-3 fatty acid in the human diet is beneficial in prevention and treatment of cancers, heart diseases, thrombosis, arterial hypertension, hyperlipidaemia, senile dementia, Alzheimers disease, depression, or rheumatoid arthritis [8]. Cow milk contains large amounts of saturated fatty acids (SFA), particularly C14:0 and C16:0, and small amounts of mono unsaturated fatty acids (MUFA), poly unsaturated fatty acids (PUFA) and omega-3 fatty acids with beneficial effects on human health [9].

Bargur cattle are of medium sized animals with compact build body. Currently the breed is raised as a draught animal in its native area with poor milk production. Only few studies were done with the yield and composition of Bargur cow milk and no studies are there for fatty acid profile in ghee of Bargur cattle. Hence, it is necessary to know fatty acid profile in ghee of indigenous Bargur cows. In future, this will help in know the importance of Bargur cow milk and ghee and also it will enhance the value addition of Bargur cow milk in field level. Simultaneously value addition of milk will increase the income of Bargur cattle rearing farmers in Bargur hill area and also indirectly help in conservation of Bargur Cattle. Therefore, there is a need to conduct this study to identify differences in fatty acid profile of ghee prepared from indigenous Bargur cow and Holstein Friesian crossbred cow.

MATERIALS AND METHODS

Milk sample collection: Six numbers of 2nd to 3rd calving high milk producing indigenous Bargur cows were selected at early stage of lactation period (1-3 months) from Bargur Cattle Research Station, Bargur, Erode district of Tamil Nadu for this study. This research farm is maintained by Tamil Nadu Veterinary and Animal Sciences University (TANUVAS), Tamil Nadu. Six numbers of 2nd to 3rd calving high milk producing Holstein Friesian crossbred cows were selected at early stage of lactation period (1-3 months) from private farmers at foot hill of Bargur (Anthiyur), Erode district of Tamil Nadu for this study. All animals were maintained under intensive system of rearing and all animals were fed with required amount of green fodder, dry fodder and concentrate feed. Milk samples were collected from all twelve animals during morning time for testing.

Preparation of ghee by traditional / indigenous method: Fresh raw milk (boiled for 15 mins⟶ milk cooled to room temperature⟶add curd culture and kept at room temperature for overnight

Table 1. Milk fatty acids composition (%) (Mean ± S.E) in Bargur and Holstein- Friesian crossbred dairy cows maintained under intensive system of management, Tamil Nadu.

S.No.	Fatty Acids	Sample size	Bargur	Holstein –Frisian crossbred	't' value
1	Myristic Acid (C14)	6	15.50±0.77	13.97±1.01	1.20^{NS}
2	Palmitic Acid (C16)	6	44.06±0.85	37.31±2.97	2.19^{*}
3	Stearic Acid (C18)	6	8.54±0.41	12.66±1.91	2.11^{NS}
4	Oleic Acid (C18:1)	6	22.88±1.57	23.38±2.44	0.17^{NS}
5	Linoleic Acid (C18:2)	6	0.86±0.13	1.94±0.07	7.08^{**}
6	Linolenic Acid (C18:3)	6	0.51±0.06	0.04±0.04	6.49^{**}
7	Palmitoleic Acid (C16:1)	6	2.64±0.25	1.49±0.13	4.16^{**}
8	Others	6	9.97±0.98	9.18±1.07	0.46^{NS}

^{NS}- Not significant ($P \leq 0.05$), * - significant at 5 % level of significance ($P \leq 0.05$), **- Significant at 1 % level of significance ($P \leq 0.01$)

(fermentation) → curd → churning by churner at 10°C to get desi butter →converted to ghee (stored at room temperature)

Analysis of fatty acid profile of ghee samples: All the 12 numbers of ghee samples were analyzed for fatty acid profile in Chemito Instruments Pvt. Ltd. - GC 8610 gas chromatograph and results were obtained from the Animal Feed analytical and Quality Assurance Laboratory (AFAQAL), Veterinary College and Research Institute, Namakkal which is NABL accredited laboratory as per the procedure mentioned by Folch et al. [10] and Wang et al. [11]. Datas were statistically analyzed with 't' test and interpreted. The independent sample student 't' test analysis was performed using IBM SPSS Statistics® 26.0.

RESULTS

Results showed that saturated fatty acids like myristic acid (C14), palmitic acid (C16) and stearic acid (C18) in indigenous Bargur cow and Holstein Friesian crossbred cow were 15.50±0.77, 44.06±0.85 and 8.54±0.41, 13.97±1.01, 37.31±2.97 and 12.66±1.91 respectively.

Results showed that unsaturated fatty acids like oleic acid (C18:1), linoleic acid (C18:2), linolenic acid (C18:3) and palmitoleic acid (C16:1) in indigenous Bargur cow and Holstein Friesian crossbred cow were 22.88±1.57, 0.86±0.13, 0.51±0.06 and 2.64±0.25, 23.38±2.44, 1.94±0.07, 0.04±0.04 and 1.49±0.13 respectively (Table 1).

Results showed that in indigenous Bargur cow palmitic acid (C16) 44.06±0.85 was in higher proportion and linolenic acid (C18:3) 0.51±0.06 was in lower proportion, similarly in Holstein Friesian crossbred cow palmitic acid (C16) 37.31±2.97 was in higher proportion and linolenic acid (C18:3) 0.04±0.04 was in lower proportion.

DISCUSSION

Based on the results showed in Table 1 there is no significant difference was observed between indigenous Bargur cow and Holstein Friesian crossbred cow in saturated fatty acids like myristic acid (C14) and stearic acid (C18), and also no significant difference was observed in unsaturated fatty acid like oleic acid (C18:1). The unsaturated fatty acid linoleic acid (C18:2) was significantly higher ($P \leq 0.01$) in Holstein Friesian crossbred cow when compared with indigenous Bargur cow. This study showed that saturated fatty acid palmitic acid (C16) was significantly higher ($P \leq 0.05$) in indigenous Bargur cow, similarly unsaturated fatty acids like linolenic acid (C18:3) and palmitoleic acid (C16:1) were also significantly higher ($P \leq 0.01$) in Bargur cow when compared with Holstein Friesian crossbred cow.

These results of fatty acid profile (Table.1) were similar to Saroj *et al*. (2017) [12] who reported that Palmitic acid (C16:0), Oleic acid (9-cis C18:1), Stearic acid (C18:0) and Myristic acid (C14:0) accounted for more than 65 % of Total fatty acid.

These results of fatty acid profile (Table 1) were similar to the findings of Rodriguez-Alcala et al. [13] and Talpur et al. [14] who reported that saturated fatty acid as main fatty acid and accounted about 67% to 75% of total fatty acid.

These results are similar to Mele et al. [5], who reported that bovine milk fat consists of 65, 32 and 3% of saturated, monounsaturated and polyunsaturated fatty acids respectively. Similar results are reported by Jensen [15] who found saturated fatty acids (SFA), monounsaturated fatty acids (MUFA) and poly unsaturated fatty acids (PUFA) account for 69%, 27% and 4% of the total milk fat, respectively.

CONCLUSION

With this study the uniqueness of indigenous Bargur cow milk interms of fatty acid profile was identified and compared with Holstein Friesian crossbred cow. This study concludes that saturated fatty acid like palmitic acid (C16) was significantly higher ($P \leq 0.05$) in indigenous Bargur cow, similarly unsaturated fatty acids like linolenic acid (C18:3) and palmitoleic acid (C16:1) were also significantly higher (($P \leq 0.01$)) in indigenous Bargur cow when compared with Holstein Friesian crossbred cow. In this study only few fatty acids were studied, to know complete uniqueness of indigenous Bargur cow, however, a further complete fatty acids are need to be studied, the work is in progress.

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