

Effect of Different Seasons on Cross-Bred Cow Milk Composition and Paneer Yield in Sub-Himalayan Region

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ABSTRACT : The study was designed to evaluate the seasonal influences on cross-bred cow milk composition and paneer yield in Dhauladhar mountain range of sub-himalayan region. Fifty samples from each season were collected from a herd of Jersey×Red Sindhi×Local cross-bred cows during summer (April-June), rainy (July-September) and winter (November-February) and analyzed for fat, total solids (TS) and solids not fat (SNF). Paneer was prepared by curdling milk at $85\pm 2^{\circ}\text{C}$ with 2.5 per cent citric acid solution. Overall mean for fat, TS and SNF content of milk and paneer yield were 4.528, 13.310, 8.754 and 15.218 per cent respectively. SNF and TS content varied among seasons being highest in winter (8.983% and 13.639%) followed by summer (8.835% and 13.403%) and lowest in rainy season (8.444% and 12.888%). Paneer yield was lowest (14.792%) in rainy season and highest (15.501%) in winter season. (*Asian-Aust. J. Anim. Sci. 2002, Vol 15, No. 4 : 528-530*)

Key Words : Seasonal Variation, Milk Composition, Paneer Yield, Sub-Himalayan Region

INTRODUCTION

Paneer is an acid-cum-heat coagulated milk product prepared by using soft organic acids like citric, tartaric, lactic acid etc. at high temperatures. It is considered as soft cheese and used throughout India for the preparation of various sweetmeats and vegetable dishes. Although it is commonly prepared from buffalo milk (Singh and Kanawjia, 1990) but various workers have also successfully utilized the cow and goat milk for the preparation of paneer/chhana (Masud et al., 1992; Sharma et al., 1995, 1998).

The quality and quantity of the finished product depends on the quality and composition of raw material used. The various factors such as stage of lactation (Sharma et al., 1985; Auldish et al., 1998), feeds (Mackle et al., 1999), seasons (Hang et al., 1982 and Auldish et al., 1998) etc. influence the composition of milk which in turn affects the quality and yield of paneer. The scanty information is available on the effect of the seasons on milk composition of cross-bred cows and ultimately on the paneer yield. Moreover, no information is available on the seasonal effect on milk composition and paneer yield of cross-bred cows in Dhauladhar mountain range area of sub-himalayan region which has heavy rainfall and longer winter season. Therefore, in the light of above discussed features, the present investigation was planned to assess the effect of seasonal variations on milk composition and yield of paneer of cross-bred cows in this area.

MATERIAL AND METHODS

The herd milk samples were collected within 1-2 h of milking of cross-bred (Jersey×Red Sindhi×Local) cows reared at Livestock Farm, CSK-HPKV, Palampur (H.P.) India. The total 150 milk samples viz. 50 from each season namely summer (April-June), rainy (July-September) and winter (November-February) were collected and analyzed for fat, solids not fat (SNF) and total solids (TS) content before using for paneer preparation. Fat content of the milk was analyzed by Gerber's method (ISI, 1958). SNF was calculated by Richmond's formula ($\text{S.N.F.}\% = \text{CLR}/4 + 0.25\text{F} + 0.44$ at 29°C). The TS content was estimated by adding SNF and fat percentages.

Preparation of paneer

The milk after analysis was used for paneer preparation in a batch of 30-40 liters by applying direct acidification process described by Kosikowski, 1982. The milk was filtered and heated to $85\pm 2^{\circ}\text{C}$ with regular stirring and 2.5 per cent citric acid solution was added in milk till greenish whey (complete curdling) occurred. The coagulated mass was then strained through muslin cloth and pressed for 20 minutes. The product was dipped in chilled water ($5\pm 1^{\circ}\text{C}$) for 1 hour. After that the paneer was kept for 10 minutes at room temperature for drainage of extra water and the weight of paneer was recorded. The per cent yield was calculated on the basis of volume of raw milk used and weight of the paneer obtained.

The data thus obtained was statistically analyzed by computerized statistical programme "Instat" to calculate the critical differences for comparison of mean values to establish the treatment effect on various parameters.

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RESULTS AND DISCUSSION

Milk constituents

The ANOVA for milk constituents and paneer yield along with the mean values in different seasons have been presented in table 1 and 2. Overall mean fat (4.5%), TS (13.31%) and SNF (8.75%) content of cross-bred cows were almost similar to the standard values prescribed by the ISI standards for cow milk (ISI, 1958). Similar results were expressed by Masud et al. (1992). Our results also revealed significant effect of seasons on TS and SNF content of milk. Auld et al. (1998) confirmed the effect of seasons on SNF content of the bovine milk in a study conducted on dairy cows in New Zealand.

In the present study all the three milk constituents showed the highest mean values in winter and the lowest in rainy season. It is attributed to the fact that the green fodder is available in the sub-himalayan region after rainy season. Moreover it has been observed that water intake by the

cows is drastically reduced in winter season, which in turn reduces the yield and increases fat percentage whereas in the rainy season the percentage of milk constituents is reduced but milk yield is increased. The mean values recorded for all three milk constituents were similar in winter and summer seasons but differ significantly in rainy season especially in respect of TS and SNF content. These results are in accordance with the fact that the summer temperature in this region is not as harsh as in case of Northern Indian Plains.

Paneer yield

The overall mean values observed for yield of paneer (15.218%) were in consonance with the results of various workers (Masud et al., 1992; Sharma et al., 1995). The paneer yield depends mainly on TS content of milk (Spurgeon et al., 1981; Phelan, 1981) which varies with various seasonal and physiological factors (Chapman, 1981; Sharma et al., 1985). The paneer yield was recorded

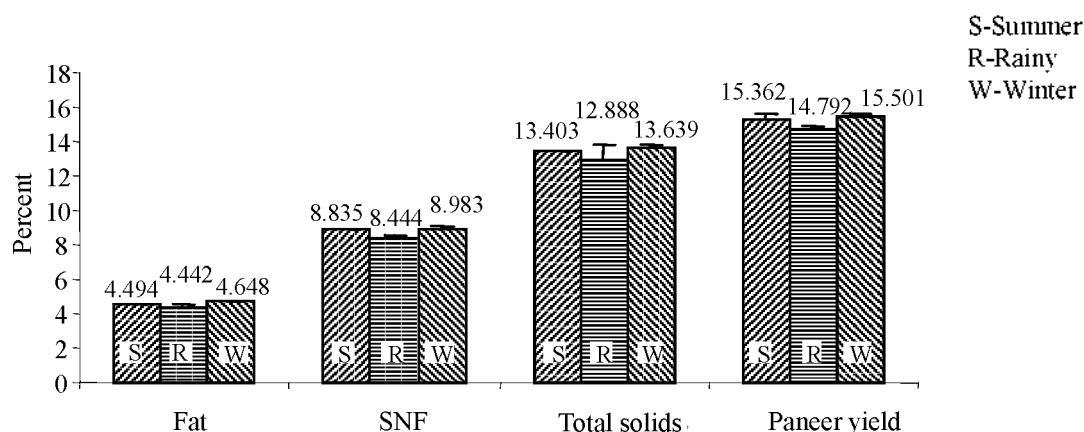


Figure 1. Fat, S.N.F., T.S. and Paneer yield as influenced by different seasons

Table 1. Effect of different seasons on milk composition and yield of paneer (Mean±SE)

Characteristics	Seasons			Overall mean
	Summer	Rainy	Winter	
No. of observations	50	50	50	150
Fat (%)	4.494 ^a ±0.0678	4.442 ^a ±0.0561	4.648 ^a ±0.0797	4.528±0.0679
TS (%)	13.403 ^a ±0.121	12.888 ^b ±0.841	13.639 ^a ±0.115	13.310±0.359
SNF (%)	8.835 ^a ±0.081	8.444 ^b ±0.093	8.983 ^a ±0.060	8.754±0.078
Paneer yield (%)	15.362±0.232	14.792±0.201	15.501±0.185	15.218±0.206

^{a,b} Mean values in rows with different superscripts differ significantly (p<0.001).

Table 2. Analysis of variance for different milk constituents and yield of paneer

Source	d.f.	Mean sum of squares			
		Milk constituents			Paneer yield (%)
		Fat (%)	TS (%)	SNF (%)	
Seasons	2	35.682	102.860***	34.280***	329.070
Residuals	147	0.808	0.699	0.280	9.189

*** p<0.001.

significantly lower in rainy season in comparison to both summer and winter season. The mean value for paneer yield in winter season was highest (15.501%) but was almost equal to the mean value recorded for the summer season (15.362%). These observations are also in accordance with the TS content of milk observed in different seasons.

On the basis of this investigation, it is concluded that the seasonal variations in this part of subcontinent influences the SNF and TS content of milk. During rainy season significantly lower values were recorded for SNF and TS content of milk. Variations in solids not fat and total solids content of milk were the major causes of variations in the final yield of paneer.

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