

Seasonal Variation in Phospholipids Content of Buffalo Ghee*

C. H. Joshi and S. H. Vyas

Dairy Technology Department, Gujarat Agril. University, Anand Campus, Anand.

ABSTRACT

The average phospholipids content of thirty six samples of Surati buffalo ghee collected from Amul (Kaira District Co-operative Milk Producers Union) was found to be 23.08 mg/100 gm with a variation of 9.00 mg to 40.52 mg per 100 g of sample. Winter ghee contained higher amount of phospholipids (28.94 mg/100 gm) compared to summer ghee (16.91 mg/100 gm) while monsoon ghee showed the average of the two seasons (22.82 mg) indicating statistically highly significant effect of the season.

(Received on Janu. 11, 1974)

INTRODUCTION

THOUGH THE PHOSPHOLIPIDS are the minor constituents of milk, they play an important role in the keeping quality and oxidation of milk fat. Baliga and Basu (1956), Narayanan *et al* (1966), Rajput and Narayanan (1968), Ram-murthy *et al* (1968, 69) reported seasonal variation in phospholipids content of ghee. They also observed that the treatments given during manufacturing of ghee were also responsible for the variation in phospholipids content. In the present study the seasonal variation in phospholipids content of ghee was studied.

MATERIALS AND METHODS

(1) Thirty-six samples of buffalo ghee were collected from Kaira District Co-operative Milk Producer's Union Ltd. (Amul) Anand during the period from

September 1971 to September 1972 and the results have been grouped into three seasons i.e. winter, (November-February), summer (March-June) and monsoon (July-October).

The methods of analysis adopted were as follows:

The determination of phospholipids content of ghee was done as Harris and Popat (1954) in which perchloric acid was used for digestion of fat. As reported by Analytical Methods Committee (1959) digestion with perchloric acid forms an explosive mixture; but as suggested by Harris and Popat (1954) this hazard can be reduced by the use of a minimum amount of sample which reduced the heat liberated. In the present study the sample of the ghee was taken as 0.07-0.10 gm in 20 ml pyrex test tube and 1.2 ml—60% perchloric acid with on

* Part of Ph.D. Thesis submitted by first author to Gujarat Agricultural University, 1974.

drop of concentrated nitric acid was used for digestion. The digestion was carried out in mild heat of spirit lamp. From digested and oxidised sample; phosphorus was estimated by colorimetric method suggested by Taussky and Shorr (1959) which was based on the formation of phosphomolybdate and reduction of this molybdate with a suitable reductant to give molybdonami blue colour. To convert phosphorus into phospholipids a factor 25.9 as suggested by Rammurthy and Narayanan (1966) was used and the results were expressed as mg per 100 gm of *ghee*.

(2) The fractionation of *ghee* was done by melting the sample (500 ml) at 30°C and storing at 29°C for 72 hrs. The granulated *ghee* was filtrered through muslin cloth and the amount of liquid and solid portion was recorded.

(3) Fatty acid components of *ghee* were determined by gas-liquid chromatographic (GLC) method as suggested by Smith (1961).

(4) Melting point (MP), Acid value (FFA), Butyro-refractometer (B.R.) valve,

Polenske value (PV), Saponification value (SV) and Iodine value (IV) were determined as per ISI (1966).

RESULTS AND DISCUSSION

The seasonal variation in the phospholipids content of *ghee* with the critical difference (CD at 5%) for statistically significant variations have been summarized in Table 1.

The phospholipids content in unfractionated *ghee* was found to be 28.94, 16.51 and 22.82 mg/100 gm of *ghee* in winter, summer and monsoon respectively. The average phospholipids content of *ghee* was observed 23.08 mg/100 gm of *ghee*. The average phospholipids content of *ghee* was found to be 23.08 mg/100 gm of *ghee* which is in agreement with the findings of Baliga and Basu (1956) who have reported 25 mg/100 gm of phospholipids in buffalo *ghee*. The variation in phospholipids content of *ghee* was found to be 9 to 40.52 mg which is in agreement with Rammurthy and Narayanan (1966) who have also reported 7 to 60.3 mg/100 gm.

TABLE 1
Seasonal variation in the phospholipids content of unfractionated *ghee* and its liquid and solid portion.

Season	Phospholipids content in mg/100 gm of <i>ghee</i>								
	Unfractioned			Liquid portion			Solid portion		
	Min.	Max.	Av.	Min.	Max.	Av.	Min.	Max.	Av.
Winter	19.10	37.70	28.94	21.80	47.40	30.43	14.30	38.80	27.91
Summer	9.80	23.40	16.51	9.80	24.60	16.21	14.20	30.90	17.96
Monsoon	19.20	27.30	22.82	18.80	25.90	23.57	13.80	35.00	21.28
Average		23.08			23.79			22.84	
C.D. @ 5% level		2.89			3.45			4.13	

The seasonal variations of the phospholipids content of *ghee* was found to be highly significant ($P < 0.05$) with C.D. as 2.89 mg. Baliga and Basu (1956) observed marked seasonal variation of phospholipids content in milk. The pattern of variation in milk was found to be similar to that of *ghee* observed in present study.

While studying the fractionation effect it was observed that the phospholipids content in liquid and solid portions of *ghee* was higher in winter season as compared to summer and monsoon season. However, the difference in phospholipids content in unfractionated *ghee*, liquid portions and solid portions of *ghee* was not significant. The average phospholipids content in liquid and solid portions of *ghee* were found to be 23.9 mg and 22.84 mg/100 gm, respectively.

The effect of various chemical characteristics of *ghee* on the phospholipids content of *ghee* was studied and have been tabulated in Table 2. There was significant positive correlation between FFA, MP, saturated fatty acids and phospholipids content and was negatively co-

TABLE 2

Correlation coefficient (r) between phospholipids and properties of *ghee*.

Properties	Phospholipids
FFA	0.635**
IV	-0.314
SV	0.200
MP	0.863**
Liquid portion	-0.589**
Saturated Fatty acids	0.458**
Unsaturated Fatty acids	-0.457**

** Significant at 1% level.

related with liquid portion, unsaturated fatty acids. The correlation was highly significant ($P < 0.01$). In winter *ghee* MP, saturated fatty acid and phospholipids content were higher and the amount of liquid portion was low indicating that the phospholipids are associated with high melting triglycerides (HMG) fat globule membrane. The observations are in agreement with Jenness and Palmer (1945) who stated that HMG was closely associated with phospholipids content of fat globule membrane.

REFERENCES

- Analytical Methods Committee, 1959. Report prepared by metallic impurities in organic matter subcommittee. Notes on perchloric acids and handling in analytical work. *Analyst*. **84**: 2145.
- Baliga, B. S. and K. P. Basu. 1956. Phospholipids in dairy products. *Indian J. Dairy Sci.* **9**: 95.
- Harris, W. D. and P. Popat. 1954. Determination of phospholipids content. *J. Am. Oil Chem. Soc.* **31**: 124.
- I.S.I. 1967. Indian standard methods of sampling and test for ghee. 15: 3508-1966. Indian Standards Institution, New Delhi.
- Jenness, R. and L. S. Palmer, 1945. Substance absorbed on fat globule and cream and their relation to churning. *J. Dairy Sci.* **28**: 653.
- Narayanan, K. M., M. Rammurthy and V. Bholerao. 1966. Proc. XVIII Int. Dairy Congress. C-215. (*C.F. Dairy Sci. Abstr.* **30**: 177).
- Rajput, D. S. and K. M. Narayanan. 1968. Effect of ripening of cream and storage of butter on phospholipid content. *Indian J. Dairy Sci.* **21**: 1.
- Rammurthy, M. K. and K. M. Narayanan, 1968. Method for estimation of phospholipids in cream and milk products. *Indian J. Dairy Sci.* **19**: 1.
- Bhalerao. 1968. Effect of phospholipids on keeping quality of ghee. *Indian J. Dairy Sci.* **21**: 1.
- The role of *ghee* residue as anti-oxidants. *J. Dairy Sci.* **22**: 57.
- Smith, L. M. 1961. Quantitative analysis of milk by gas-liquid chromatography. *J. Dairy Sci.* **44**: 1.
- Tausky, H. H. and E. Shorr. 1953. The microcolorimetric method for the determination of inorganic phosphorous. *J. Biol. Chem.* **202**: 1.