Studies in preparation, preservation and renovation of butter and ghee

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Ghee is the most convenient form in which milk fat could be preserved for human consumption, especially under tropical and sub-tropical conditions. The importance of ghee in our dietary is well known and need not be emphasized here. Unfortunately, ghee that is made available in the markets to the bulk of the population is deplorably poor in quality, with an unpleasant smell and is often adulterated. Adulteration is intentional, the motive being excessive profiteering. Other reasons for the bad quality are entire indifference and ignorance to an extent on the part of producers in preparing and preserving the product. Good ghee can be easily made and at no greater cost than bad or indifferent ghee.

The factors responsible for the spoilage of ghee have been found by the various workers to be the following :

(1) Unsuitable and improperly cleaned vessels used for handling milk, curds, butter and ghee. (2) Defective boiling of milk for conversion into curds. (3) Bad quality starters and defective ripening. (4) Accumulation of butter for a number of days to get sufficient quantity for conversion into ghee. (5) Improper washing of butter, that is, free of the adhering and heldup curd particles. (6) Defective storage of ghee, exposed to air and light which hasten the spoilage of the product and (7) Contact with porous earthenware and metals like copper, brass and iron without proper tinning, which increase the spoilage.

The defects pointed out in ghee making and storage are controllable, and good ghee could be produced, which would keep well for reasonably long periods. Studies were made with the object of evolving suitable methods of making butter and ghee with low initial acidity and methods of renovating bad butter and ghee, that are normally available in the market. The study was confined to practical methods that could be easily adopted in an ordinary household without any additional out-lay or equipment.

For all these trials buffaloes milk produced in the College Dairy was boiled and converted into curds. Butter was made from curds by the local method using the churning rod. All attempts were made to maintain uniform quality in curds, butter and ghee throughout the trials.

I. **Quality of butter:** *Washed Vs., Unwashed butter*: Butter was made from curds by the ordinary local method. The butter that floated on the butter-milk after churning was gathered. One third of this quantity was bulked and pressed with scotch hands on a butter board to remove as much of the butter-milk as possible. This was taken as unwashed sample. The remaining two thirds was transferred to a vessel of water and gently agitated for a few minutes to wash the butter granules. Half of this quantity was taken as the once washed sample, and was well pressed to remove as much wash water as possible. The remaining third was gathered, drained and transferred to another vessel of water for giving a second washing. The butter grains were agitated for a few minutes and pressed. This was taken as the twice washed sample. The acidity of the three samples of butter were determined by the Nissen's method and expressed as lactic acid. The same method of testing acidity was followed throughout the trials. The three fresh lots were converted into ghee. The ghee was filtered to remove the sediment and the samples were tested for acidity. The results of the analysis are furnished below:

	Percentage acidity:	
	Butter	Ghee
Unwashed	0·0871	0·0526
Once washed	0·0615	0·0379
Twice washed	0·0571	0·0320

The above results indicate that washing the butter reduces the acidity of butter and the resulting ghee. Hence washing the butter grains free of the adhering curd particles and butter-milk helps to give ghee with a lower initial acidity. Acidity is one of the factors promoting rancidity in ghee and reducing its storage life. The low acid ghee can be preserved without much of deterioration over a longer period than ghee with high acidity.

II. **Preservation of butter:** Fresh butter from most houses is of fair quality. The butter produced every day is small and it is accumulated till a sufficient quantity becomes available for melting into ghee. But the butter deteriorates during storage and develops a sour smell, due to the increase in the acidity of the enclosed butter-milk. Putrid odour of varying degrees develops due to changes in the proteinaceous curd particles held up by the butter. Moulds also develop on the surface of butter occasionally and such samples are devoid of the characteristic butter flavour. The deterioration that sets in butter during storage is marked and in most cases accounts for the bad quality of the resulting ghee.

The following methods of storing butter were studied with a view to find out the best method suitable for the ordinary household: (1) Dry preservation — by keeping the lump of butter in a vessal, without

any treatment. (2) Preservation under brine — by pressing the butter firmly to the bottom of a vessel and keeping it submerged in saturated common salt solution. (3) Preservation under water — by pressing the butter firmly to the bottom of a vessal and keeping it submerged in water. (4) Preservation under butter milk — by pressing the butter firmly to to the bottom of a vessal and keeping it submerged in butter-milk.

Water and butter-milk used for submerging the butter were changed every day. In all cases small aluminium vessals of the same size and shape were used and covered with lids and kept inside a cup-board. Samples of butter were drawn on the 4th, 8th and 12th day and converted into ghee. The acidity of the butter and ghee samples were as follows;

Days of storage of Butter.	% Acidity as lactic acid.			
	Methods of storage			
	Dry.	Under Brine.	Under Water.	Under Butter-milk.
		Butter.		
0	0·0775	...	...	...
4	0·1086	0·1251	0·0950	0·0937
8	0·1551	0·1413	0·1061	0·0937
12	0·1636	0·1885	0·1619	0·1830
		Ghee.		
0	0·0506	...	...	...
4	0·0657	0·0706	0·0613	0·0547
8	0·0780	0·0750	0·0715	0·0694
12	0 0850	0·0756	0·0739	0·0897

The following observations were made during the storage of butter and the making of ghee:

A. BUTTER: (i) *Dry preservation*: Butter got dried up on the surface by losing moisture. The dry appearance got more pronounced with increase in the storage period. From the 8th day onwards there was change in colour and decrease in flavour. On the 12th day the butter was badly mouldy, and off-flavour was very marked. (ii) *Brine preservation*: There was no change in colour. From the 8th., day onwards there was loss in flavour and on the 12th., day off-flavour was marked. But the quality was much better than the dry preserved sample. (iii) *Water preserved*: The changes were exactly the same as in the case of brine preserved butter. (iv) *Butter-milk preserved*: There was no change in colour right through. The flavour was also maintained even till the 12th., day. The butter looked fresh with the characteristic butter-milk flavour. This was the best of the lots, and good enough for consumption as butter.

B. GHEE: (i) *Dry preserved butter*: Due to the dryness of butter, it took minimum time for conversion into ghee. During boiling, pungent odour was emitted, and there was also spurting of the material. These two characteristics, viz. pungent odour and spurting, were not met with in the other samples. Quality of ghee was tolerable, but the true ghee flavour was not conspicuous. Ghee made from 12 days old butter had a marked off-flavour. (ii) *Water preserved butter*: The quality of ghee made with 4 days old butter was fairly good. Ghee from the samples, 8 and 12 days old respectively, were not so good, but were tolerable. (iii) *Brine preserved butter*: The quality was exactly the same as that of the samples under water (ii). (iv) *Butter-milk preserved butter*: All the samples of ghee were fairly good and free from any off-flavour. The quality was decidedly better than ghee from the other samples.

Thus, preservation of butter under butter-milk appears to be the best method. Preservation under water is next best. Preservation under brine is unnecessary and dry preservation is undesirable. In any case, butter should be melted in as fresh a state as possible, preferably every fourth day as being convenient.

III. **Renovation of butter**: Trials were made with the object of renovating and improving the quality of bad quality bazaar butter. A portion of the butter was directly converted into ghee (sample A). The rest of the butter was well washed under the tap by kneading till the wash water was clear. A portion of the washed butter was boiled into ghee (sample B). The remaining portion was boiled with thin slices of fully ripe banana fruits (without rind) at one ounce of slices per pound of butter (sample C). In all the cases the butter and ghee samples were tested for acidity with the following results.

	% Acidity as lactic acid	
	Butter.	*Ghee.*
A. Bazaar butter	0·1741	0·0820
B. Washed butter	0·1125	9·0536
C. Washed butter boiled with banana slices	0·1125	0·0295

The unwashed butter had an acid smell and bad odour. The washed butter had acid smell and the colour was much improved due to the removal of the adhering dirt. But the butter got pasty and soft during washing and there was improvement in the quality of the resulting ghee. The butter was boiled with banana slices, till the slices were brownish in colour and flaccid at the end. While the ghee was cooling, the slices turned dark, got firm and looked like charred banana chips. The ghee made with the original sample of bazaar butter was bad. Washing the butter improved the quality of the resulting ghee. When banana slices were added during boiling, the ghee produced was free of bad odour and of fair quality.

IV. **Renovation of ghee:** A sample of bad smelling rancid ghee was reboiled with banana slices at one ounce to the pound, till the slices turned brown. During cooling, the slices turned dark in colour. The ghee was filtered and tested for acidity, with the following results: Rancid ghee sample 0·1221 ; reboiled with banana slices 0·0380.

The original sample of ghee was unpleasant in smell and repulsive to the taste. The ghee after reboiling with banana slices was passable in in flavour and taste. This appears to be a suitable method of renovating rancid ghee.

Summary: 1. Washing butter grains free of the adhering and held-up butter-milk before bulking gives good quality butter and ghee. 2. When butter is stored for some days, it is advisable to keep it submerged in thin butter-milk and change it every day. 3. Bad butter can be improved by washing it throughly with clean and sweet water, kneading it well during washing, till the wash-water is clear. The ghee obtained from washed butter is nearly normal. By adding ripe banana slice at an ounce to each pound of old butter, during boiling, fairly good ghee could be produced. 4. Rancid ghee can be renovated by boiling it again with slices of fully ripe bananas at an ounce to a pound (roughly 1 fruit per pound) till the slices get browned. The recommendations made are simple, practicable, cheap and easily adaptable.

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