

Removal of High Acidity in Ghee.

by

SRI M. SANYASI RAJU,

and

SRI S. VARADARAJAN,

(Agricultural Research Institute, Coimbatore)

Introduction: It was described in a note by the Bureau of Public Information, Government of India, that a simple process for the removal of free-fatty-acids in ghee had been worked out under the auspices of the I. C. A. R. The method was acclaimed to be simple, involving no new or extra equipment from those used in ghee making. The loss of ghee due to removal of the acid fraction and during the processing was said to be small. The resultant product was said to be wholesome which would fetch a better price than the original high acid ghee. In order to test the method suggested in the note, experiments were conducted for the removal of high acidity in ghee. Sambasiva Rao (1949) studied several methods suitable for adoption by the housewife for preparing good ghee from butter and found that preservation under butter milk was the best. He also describes a method for renovation of bad smelling rancid ghee, by boiling it with banana slices. This treatment seems to have given a ghee passable in flavour and taste.

Materials and Methods: The ghee samples were prepared as follows: Ghee was melted at about 70°C. when powdered lime of good quality was sprinkled on it at the rate of 3 per cent of the total quantity of ghee taken. The mixture was then well stirred and heated rapidly to 102°C. It was then filtered by passing it through a filter cloth over a funnel.

Two sets of treatments were made on ghee and coconut oil, one in the laboratory of the Government Agricultural Chemist and the other in the College Dairy as per details given below :

Treatments.

(A) Treated in the College Dairy:

Nature of sample	Treatments
1. Good quality ghee prepared in the College Dairy, from buffalo butter	Not treated (control 1)
2. Poor quality ghee (purchased)	(" " 2)
3. Poor quality ghee (same as 2)	Plus 3% CaO pure
4. Poor quality ghee (same as 2)	Plus 3% local lime (impure)
5. Poor quality ghee (same as 2) blended with 25% good quality ghee (sample No. 1)	Plus 3% local lime (impure)
6. Coconut oil	Not treated (control)
7. Coconut oil (Same as 6)	Plus 3% local lime (impure)

(B) Treated in the Laboratory :

Nature of sample	Treatments
1 (a) Good quality ghee prepared in the laboratory from butter obtained from the Coimbatore Co-operative Milk Supply Union	Not treated (control 1)
2 (a) Poor quality ghee purchased	Not treated (control 2)
3 (a) Poor quality ghee (sample No. 2 a)	Plus 3% CaO pure
4 (a) Poor quality ghee (sample No. 2 a) blended with 50% good quality ghee (sample No. 1 a)	Plus 3% CaO pure
5 (a) Coconut oil	Not treated (control)
6 (a) Coconut oil (same as sample No. 5 a)	Plus 3% CaO pure

Each set was divided into two thus making four lots. Two lots, one of each set, were preserved in the College Dairy for observation by the Dairy Manager for flavour, aroma, body texture, colour and feel. The other two lots were preserved in the laboratory and were analysed thrice, (1) immediately after treatment; (2) three months after and (3) eight months after treatment for acidity and rancidity. Throughout the period of storage the samples were kept shut off from light but had access to air, as the mouth of the bottles were kept covered with muslin cloth. Frying tests were also carried out with the samples at the end.

Methods of Analysis: Acid value was determined by the standard method given in A. O. A. C. Rancidity was determined by Issoglios' method which consists in distilling in a current of steam a weighed quantity of oil or fat mixed with a measured quantity of water and titrating the distillate with N/100 potassium permanganate solution.

Experimental Results: The results of the experiments are presented in Tables I and II.

Discussion: Since the acid value is a measure of free fatty acids present in the sample and does not always run parallel with the production of rancidity and the determination of acid value may not always indicate the fact that a sample is not sound, rancidity was estimated in the samples by means of the "oxidisability value" i. e. the amount of oxygen consumed under standard conditions by the aldehydes and other products of rancidity after distillation in a current of steam.

It is seen from the data presented in the tables, that there is considerable difference between the two sets, the one treated in the laboratory and the other in the College Dairy. Both acidity and rancidity increase progressively with time in the case of samples treated in the laboratory, whereas there is a definite decrease in rancidity values in the second round with very slow increase in acidity in the case of those treated in the Dairy. It was ascertained from the Dairy that the samples were filtered through muslin after lime treatment which permitted a considerable portion of lime to pass through and remain at the bottom of the samples. On the other hand the laboratory samples were filtered through Whatman's No. 3 filter paper which allowed no lime to pass through. The presence of excess of free lime in Dairy samples was confirmed at the end of the eighth month by qualitative tests, whereas no free lime was found in the laboratory samples. No doubt the presence of free lime was responsible for differences in the data obtained in the analyses of the two samples since the acids produced in ghee and oil would combine with the free lime very slowly at room temperature and this is the reason for the differences in the values.

As regards the samples prepared in this laboratory, it is seen that liming has definitely retarded the development of acidity even upto eight months but it has not retarded the increase of rancidity in both ghee and oil samples as indicated by the results obtained in the third round of analysis.

It was seen that in spite of favourable analytical indications, especially in point of acidity, the treated as well as untreated samples have all become definitely bad and unfit for consumption in point of taste and aroma. When heated they all emitted a very objectionable odour. The treated samples had in addition acquired a pronounced limey taste and flavour even from the very beginning.

It may be stated that while the treatment of ghee with lime retards the development of acidity upto eight months and rancidity upto three months; the treatment does not improve the product in point of taste and aroma. In the case of coconut oil the treatment could be said to have improved the initial samples, besides slowing down the rate of deterioration and thereby increasing the marketable period. The lime treatment resulted in a smoking ghee, which gave a burnt taste to fried things.

Summary: The treatments with chemically pure as well as local quicklime improved the colour, but the flavour and aroma were

almost completely lost in samples prepared at the Dairy, though an improvement in flavour and aroma was noticed in the samples prepared in the laboratory. In both the samples the smell of lime was persistent.

In both the above sets in the treated samples no perceptible deterioration occurred during the first two months of storage whereas the untreated control as well as the standard good quality ghee deteriorated all round.

The deterioration was more rapid at the end of three months, the rate being faster in the bazaar ghee used as control. The rate of deterioration and the final product in the case of quality ghee compare favourably with all the treated samples and is in no way inferior.

The treatment with lime tended to produce smoking ghee, giving a burnt taste to fried things.

The treatment of ghee with lime did not improve the quality of ghee, in point of taste and aroma.

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STATEMENT I
Removal of High Acidity in Ghee and Coconut Oil—Observations on Samples Prepared at the Dairy

	S A M P L E S							
	I	II	III	IV	V	VI	VII	Remarks
	Good quality ghee	Poor quality bazaar ghee	Poor quality ghee treated with 3% CaO pure	Poor quality ghee treated with local lime	Poor quality plus 50% good ghee treated with 3% lime	Coconut oil bazaar sample	Same as VI treated with 3% lime	
At commencement	Good	Poor	Colour and taste good	Slightly inferior to sample III	Same as sample IV	Good flavour and taste	Slightly better than sample VI	
Third month	Rapid loss of quality	Rapid deterioration	Rapid deterioration except colour	Very rapid deterioration Loss in taste	Very rapid deterioration. Taste bad	Very rapid deterioration. Bad taste	Rapid loss in flavour, aroma and taste	Deterioration set in
Eighth month	Very rapid loss in taste, body and aroma. Alcoholic taste	Badly deteriorated. Very bad smell	Rapid fall in taste, flavour and aroma bad	Gradual deterioration Rancid smell	Rapid deterioration. Very bad flavour and aroma	Badly deteriorated. Very bad rancid smell	Not so rapid loss. Moderate all round	Fall in quality
Frying quality	Good frying ghee. Non-smoking. Taste good	Good frying non-smoking but fried stuff bad smell	Slightly smoking ghee. Non-charring	Ghee smoking, charring and burnt taste	Ghee smoking, charring and burnt taste	Frying slow. Good white non-charred stuff obtained. Taste poor	Good frying. Taste better than sample VI	Not good for domestic use

TABLE I
Showing the Development of Acidity and Rancidity in the Samples of Ghee and Coconut Oil After Treatment in Laboratory Samples

No.	Nature of Sample	Treatment	FIRST ROUND		SECOND ROUND		THIRD ROUND	
			(a)	(b)	(a)	(b)	(a)	(b)
1 a.	Good quality ghee prepared in the laboratory from butter obtained from the Co-operative Milk Supply Union	..	0.423	3.2	0.606	2.4	0.747	4.0
2 a.	Poor quality ghee (purchased)	..	0.959	2.8	1.440	6.4	1.847	9.6
3 a.	Poor quality ghee (sample 2a)	..	0.014	3.2	0.127	3.2	0.367	15.2
4 a.	Poor quality ghee (sample 2a) blended with 50% good quality ghee (sample 1a)	..	0.014	2.4	0.042	4.4	0.169	8.4
5 a.	Coconut oil	..	1.311	6.0	2.143	1.6	2.509	4.0
6 a.	Coconut oil	..	0.606	4.0	0.888	0.8	1.255	18.4

Note: (a) Acidity Oleic acid %; (b) Rancidity Mgm. Oxygen.

TABLE II
Showing the Development of Acidity and Rancidity in Ghee and Coconut Oil After Treatment in Dairy Sample

No.	Nature of Sample	Treatment	FIRST ROUND		SECOND ROUND		THIRD ROUND	
			Acidity as Oleic acid %	Rancidity Mgm. Oxygen	Acidity Oleic acid %	Rancidity Mgm. Oxygen	Acidity Oleic acid %	Rancidity Mgm. oxygen
1.	Good quality ghee prepared in Dairy from buffalo butter	.. Not treated	0.367	6.0	0.409	2.0	0.564	3.6
2.	Poor quality ghee (purchased)	.. Not treated	1.213	3.6	1.255	1.0	1.480	5.2
3.	Poor quality ghee (sample 2)	.. Plus 3% pure CaO	0.042	4.4	0.085	2.4	0.113	8.0
4.	Poor quality ghee (sample 2)	.. Plus 3% local limo	0.085	5.6	0.141	1.6	0.141	6.8
5.	Poor quality ghee (sample 2) blended with 25% good quality ghee (sample 1)	.. Plus 3% local lime	0.014	2.4	0.141	0.8	0.169	4.0
6.	Coconut oil	.. Not treated	2.130	4.8	2.214	3.2	2.721	3.6
7.	Coconut oil	.. Plus 3% local limo	0.522	5.6	0.254	3.2	0.268	12.4