THE COPPER CONTENT OF SOME QUEENSLAND BUTTERS

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SUMMARY.

The copper content of over 250 samples of commercial butter representing churnings from 30 factories ranged from 0.05 to 0.70 p.p.m.

Comparison of butters from a factory with untinned copper equipment with those from a factory with stainless steel equipment showed a marked incidence of high copper content in the former and little evidence of copper in the latter.

An examination of copper contamination on the farm showed that the first milk through the milking machine was heavily charged with copper in one plant when bare brass equipment was used, while no such contamination was evident in a plant with stainless steel and glass equipment.

Some suggestions for reducing copper contamination in milk, cream and butter are offered.

I. INTRODUCTION.

It is well known that minute amounts of copper may accelerate the oxidation of fat and thus have a detrimental effect on the keeping quality of various dairy products. In the manufacture of butter, copper contamination of the cream may come from untinned copper and brass equipment in the factory. Cream may also have an increased copper content due to milk on the farm acquiring copper from untinned brass pipelines and other equipment. Increased use of stainless steel on the farm and in factories has to some extent reduced contamination by copper, but in many factories the problem still remains. This paper reports briefly the results of a survey of copper contamination of milk, cream and butter from some Queensland farms and factories.

II. METHODS.

Samples of butter were taken from boxes on the grading floor using stainless steel tryers. The plugs of butter were stored in acid-washed bottles.

Cream and milk samples were collected in acid-washed bottles.

Copper determinations were done by the wet-ashing method of McDowell (1947). Results are given to the nearest 0·05 p.p.m.

III. RESULTS.

Table 1 shows the distribution of results on 240 samples of butter.

Table 1.

DISTRIBUTION OF RESULTS ON 240 SAMPLES OF BUTTER.

Copper (p.p.m.).	No. of Samples.
0·05	10
0·10	56
0·15	63
0·20	46
0·25	22
0·30	13
0·35	9
0·40–0·70	21

Results on a further 14 samples of butter from one factory (A) with some bare copper equipment are given in Table 2 and are compared with six samples obtained from another factory (B) in which all the equipment was stainless steel.

Table 2.

COMPARISON OF RESULTS FROM TWO FACTORIES.

Copper (p.p.m.).	Number of Samples.	
	Factory A.	Factory B.
0·05	..	6
0·10	..	..
0·15	1	..
0·20	1	..
0·25	3	..
0·30	2	..
0·35	3	..
0·40–0·70	4	..

The copper content of a series of cream samples from factory A is shown in Table 3.

Table 3.

RESULTS OF FACTORY SURVEY.

Points of Sampling.	Copper (p.p.m.).	
	First Flow.	Later Flow.
Raw cream in neutralising vat	0·30	..
Raw cream neutralised	1·3	0·35
Pasteurised cream from balance tank	1·7	0·40
Pasteurised cream entering holding vat	1·9	..
Butter	..	0·45

Table 4 gives the results for two series of milk samples taken on farms, one (D) from a milking machine in bad condition with some bare brass showing on equipment, the other (E) from a new stainless steel and glass plant.

Table 4.

COPPER CONTENT OF MILK (p.p.m.).

Points of Sampling.	Plant D.	Plant E.
Milk direct from cows	0·15	0·15
First milk from releaser	2·0	0·20
Later milk from releaser	0·15	0·15
First milk into can	0·6	0·20
First can full	0·45	0·15

IV. DISCUSSION.

The results show that the incidence of copper contamination of butter in Queensland factories is most variable and in many instances exceeds the usually accepted limit of 0·15 p.p.m. Kruisheer *et al.* (1943) suggested that this limit might be too high. More than 45 per cent. of the butters examined in the present work have a copper content greater than 0·15 p.p.m.; consequently, if the standard taken were less than 0·15 p.p.m., approximately 75 per cent. of the samples would fall outside the desired range.

It would seem from the results that the standard of less than 0·15 p.p.m. was attainable in 25 per cent. of the samples and it is recommended that this standard be adopted for advisory purposes.

The results show that it is possible to pinpoint sources of contamination on farms and in factories.

On the farm, the milking machine appears to be the most important source of copper, but the vat, cooler and cans are also important sources.

Tables 3 and 4 give an indication of the amount of metallic contamination which can come from pumps, pipelines, vats, pasteurisers and other equipment in the factory.

The results have demonstrated the value of stainless steel in reducing contamination by copper. It is apparent that copper equipment should at least be kept well tinned and that it should, as circumstances permit, be replaced by stainless steel. As it has been shown that the first flow of cream through a plant may be heavily contaminated with copper, the first cream through the unit should be diverted to a lower grade. In the case of milk, the first flow through the plant can be similarly diverted and used for stock food.

In the butter factory, churning the first cream through the plant separately would assist in reducing the copper content of subsequent churnings.

REFERENCES.

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