

## ON A NEW METHOD OF ESTIMATING COLORING MATTER IN BUTTER AND ITS SUBSTITUTES.

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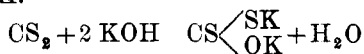
Butter varies in color, according to the season of the year in which it is made.

In summer, when the cows are fed upon grass, it is much more yellow than in winter, when the cows are fed upon dry fodder. In order, therefore, to render butter of as uniform a color as possible throughout the whole year, dairymen and farmers have been accustomed to add, or rather incorporate with the butter, a certain amount of coloring matter. This is done, not only for the above reason, but also to cater to the taste of people who think that a highly colored butter is much richer and of better quality than one not so highly colored. It is useless here to dwell upon the absurdity of this idea. Several dyestuffs have been used to color butter, but those with which we have mostly to deal are annatto, turmeric, saffron and carotene.

In order to determine the nature of the coloring matter which may have been added, it has been customary to extract the fat with weak boiling alcohol, and to make tests upon the solution so obtained. This method I have found to be very unsatisfactory for two reasons: 1st. Because it is very difficult to thoroughly extract coloring matter from the fat, on account of the insolubility of the latter in boiling alcohol. 2d. Because the small amount of fat which is dissolved by the alcohol impairs the sharpness of the color tests with sulphuric acid. These tests are therefore only applicable to alcoholic extracts of coloring matter containing no fat in solution.

Some time ago (*Analyst*, 10) Mr. Martin devised a method for determining some of the coloring matters in butter. In carrying out this test he dissolves a small quantity of fat (5 grms.) in 20 c.c. of carbon disulphide, and adds thereto 25 c.c. of solution of KOH, containing 2 drops of normal caustic potash. The mixture is now thoroughly shaken and allowed to stand. The coloring matter is said to pass into the aqueous solution, and may then be drawn off and further examined.

I have tried this test repeatedly, and have found that the aqueous solution becomes colored, whether the butter under examination had been colored or not. Furthermore, I have made a number of blank tests with both perfectly pure  $\text{CS}_2$  and the commercial article, and have found that even here the aqueous alkaline solution is colored more or less yellow, according to the length of time during which the dilute potash solution is allowed to react upon the  $\text{CS}_2$ . The formation of the above mentioned brownish yellow color is really due to a chemical reaction between the  $\text{CS}_2$  and  $\text{KOH}$ .



It is therefore evident that this test is misleading.

Mr. Martin has now perfected another method, which, briefly described, is as follows:

A small amount of butter fat, freed from water, curd and salt, is dissolved in a known quantity of  $\text{CS}_2$  and to this solution is added an equivalent quantity of methyl alcohol. The mixture is now thoroughly shaken and then allowed to stand until complete separation of  $\text{CS}_2$  and methyl alcohol has taken place. It will be found that more or less coloring matter will have passed into the alcohol, which may then be decanted and further examined.

This test is an improvement on his first one, but is still defective, for two reasons: 1st, because a small amount of fat is liable to be dissolved by the alcohol, and interfere with the sulphuric acid test; and 2d, because by this means it is almost impossible to eliminate any carotene which might be present. Carotene is easily soluble in  $\text{CS}_2$  and very difficultly soluble in alcohol. It is therefore evident that the carotene, if present, will remain dissolved in the  $\text{CS}_2$  solution, and that any amount of shaking with methyl alcohol will fail to remove it.

In the method to be described, I think that all of the above mentioned objections have been successfully overcome.

The test is based upon the observation made by me about a year ago, that if finely pulverized fullers' earth be added under constant stirring to hot, melted butter fat, and the mixture be kept warm until all the earth has settled to the bottom of the beaker, all of the coloring matter will be carried down with the fullers' earth.

The test is carried out as follows :

50 grms. of butter fat, freed from curd, salt and water, are weighed out into a small narrow beaker. The fat is then melted on a steam bath, and into it is stirred 5 or 10 grms. of finely pulverized fullers' earth. The mixture should now be thoroughly stirred for two or three minutes and then allowed to remain upon the steam bath until the earth has fully settled. As much of the clear fat as possible is now poured off into another beaker, without disturbing the sediment. To the sediment remaining in the first beaker is added 20 c.c. of benzole; the mixture is thoroughly stirred with a glass rod, the earth allowed to settle, and the benzole poured off into a clean filter.

This washing with benzole is repeated until a few drops, evaporated upon a watch glass, leave no fatty residue.

The filter paper is now rinsed with a little more benzole, and all the filtrates united in a flask. If carotene had been used for coloring the butter, it will be contained in the benzole, and may be tested for in the usual manner. Carotene is very easily soluble in  $C_6H_6$ , and very difficultly soluble in alcohol. There will, therefore, be no trouble in totally extracting it from the earthy sediment. The earthy sediment, freed from fat and carotene, is now heated upon the water bath, until the last traces of benzole have been driven off. It is then boiled out three times with about 20 c.c. of 94% alcohol. The alcoholic extracts are filtered into a tared evaporating dish, and the alcohol is then driven off. The residue left in the dish, composed of curcumine or annatto, or possibly both, is dried to constant weight at  $100^\circ C.$ , weighed, and then tested colorimetrically in the usual manner.

Curcumine and annatto are nearly insoluble in benzole, but are, on the contrary, very easily soluble in alcohol. It is therefore not likely that any of these coloring matters will be extracted by the benzole in the first operation.