STUDIES ON THE USE OF MILK POWDER IN LIQUID MARKET MILK

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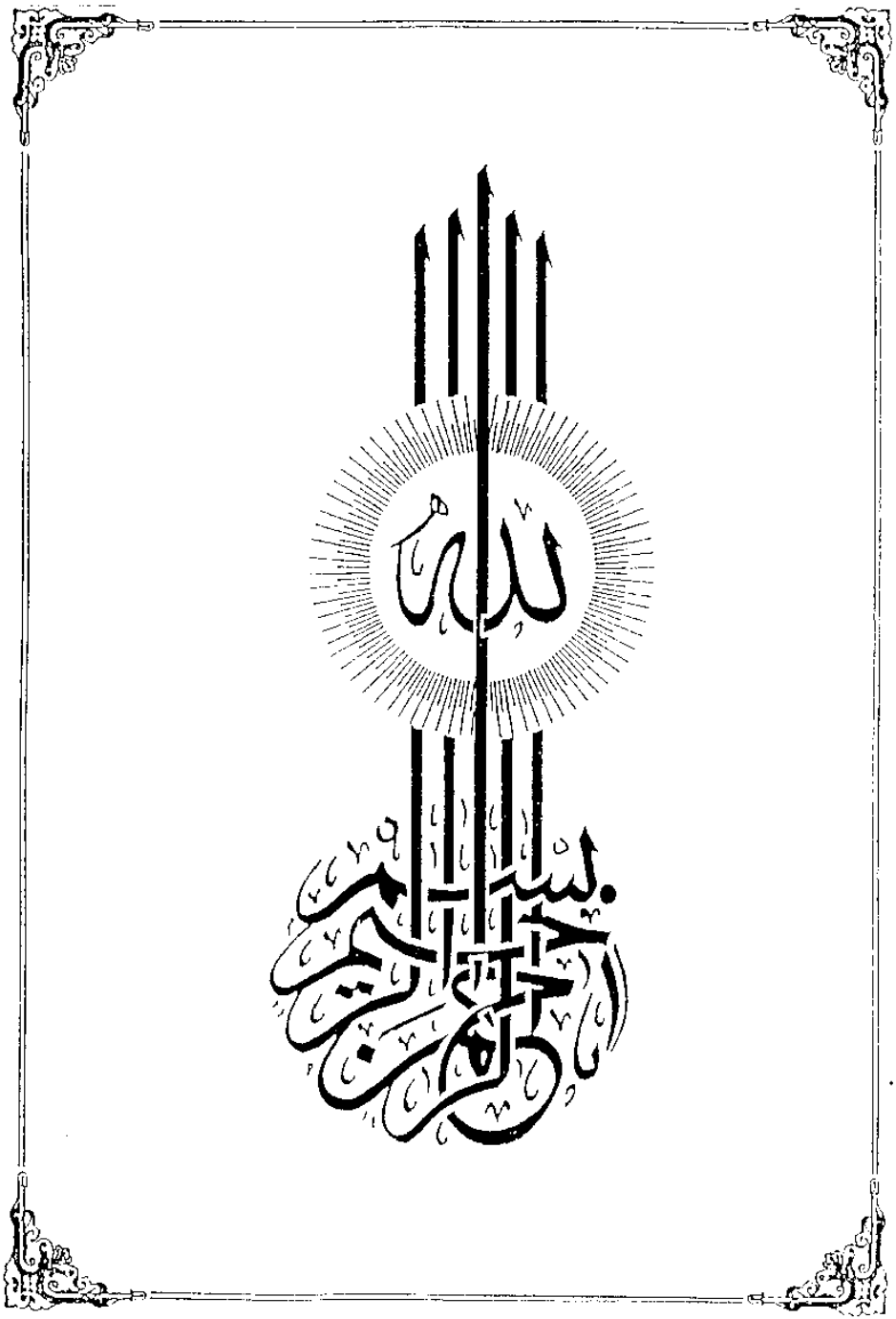

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C O N T E N T S

INTRODUCTION

(2) Protein reducing values of cow's and buffaloe's milk containing different levels of skim milk powder.

(3) Protein reducing value of milk as affected by some heat treatments.

Acheived informations could help quality control authorities in detecting added reconstituted skim milk powder to market liquid milk as well as setting up certain limits for that addition if it is to be recognised.

REVIEW OF LITERATURE

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Detecting reconstituted milk in normal milk

King et al (1944) described two methods for detection of reconstituted milk in normal milk. The first one was a modification of the Evenson test (1922), in brief : the milk is diluted with an equal volume of water and precipitated with acetic acid. The precipitate is removed by centrifuging and is washed five times with water. On the addition of 5 per cent of Na OH to the precipitate from reconstituted milk a yellow colour develops in 1 - 2 hr. and persists in the aqueous layer till the following day. The minimum amount of processed milk which can be detected in ordinary milk by this test did not stated.

The second test which reported by King et al (1944) depends on the tupe of fluorescence given under ultra-violet light. Normal fresh milk, raw or pasteursed and natural skim milk homogenised with unsalted butter or combined with fresh cream were found to give a canary-yellow colour. Mixtures containing reconstit-

cuted skim milk gave dirty ivory and mixtures containing reconstituted condensed milk gave dirty blue colours. The presence in milk of 20 to 50 per cent of reconstituted dried milk and of as little as 5 per cent of reconstituted condensed milk could be detected. The test, however, is not claimed to be invaluable.

Edwards (1950) described a method for detecting adultration of pasteurised milk with reconstituted evaporated or dried milk. This method based on the blue colour which is developed when unheated (below 75°C) milk or cream is incubated with a vanillin solution for 5 minutes at 61°C. Milk or cream heated above 75°C. did not give this colour. The activating agent was not identified.

Peatro and Moore (1950) devised a method based on the freezing points test. They found that when reconstituted skim milk containing 9 per cent solids was mxied with normal whole milk on a 50 - 50 basis the freezing point of the mixture was appreciably higher than for normal whole milk.

Choi et al (1953) developed a method which appears to be reliable for differentiating between

pasteurised milk and pasteurised milk containing a relatively small amount of reliquefied non fat dry milk solids. This method is based upon the determination of the ferricyanide reducing value of the protein fraction of milk. From the examination of 117 different brands of milk from different areas in the States they found that the protein reducing value of 4.07 mg potassium ferrocyanide per 100 ml of milk might be tentatively established as the maximum value for normal pasteurised milk. They concluded that values above this indicate either (i) excessive heating of the milk during pasteurisation or (ii) the presence of reliquefied non fat dry milk solids or other forms of processed milks. If the conditions used in pasteurisation are not known, determination of the undenatured whey proteins content of the milk will help in differentiating between these two possibilities.

Merritt et al. (1956) studied the accuracy of the protein reducing substances determination for detecting the addition of reconstituted milk to liquid market milk. They reported that this method seems possible to detect 10 per cent added reconstituted milk.

Belle and Caspar (1959) described a test to detect the presence of reconstituted milk in fresh milk which based on the colour reaction of resazurin. They found that samples containing 10 - 30 % reconstituted milk were pinkly - mauve whereas those containing 40 - 90 % were bluey - mauve.

In 1960 Touble staded that the adulteration with reconstituted milk could not be detected by the colour reaction of resazurin with certainty in fresh milk containing less than 50 % added reconstituted milk or in milk preserved with formol or trioxymethylene. He suggested that although the method as modified by Belle and Caspar (1959) is useful in routine sampling, it is not suitable for detecting fraudulent adulteration with reconstituted milk.

Junker (1960) carred out an investigation to determine the reproducibility of protein reducing substances method for detecting contamination of fluid milk with reconstituted dried milk. He found that the average protein reducing substances values for market and raw milk were 2.58 and 2.28 mg $K_4Fe(CN)_6$

per 100 ml milk respectively, only a few being over 4.0 mg. He concluded that the method is recommended as a good screening test rather than as an official method.

Chang et al (1966) examined the possibility of detecting the adulteration of raw whole milk with 3 types of reconstituted milk by measuring either total whey nitrogen, transmittance of HCl - denatured whey at 420 m u., total Ca, Ca^{++} or solubility. They found that estimation of whey protein denaturation could be used to detect gross adulteration with reconstituted dried whole or skim milk while a total Ca determination could detect the addition of $\geq$ 14 % of a reconstituted, synthetic dried milk used for feeding calves.

Recently Mishra (1966) developed a rapid qualitative visual clour test for the detection of 1 % reconstituted dried skim milk in raw or boiled milk. The test consists of the addition of 12 drops of 4 % phosphomolybdic acid to 2 grams acetic acid-precipitated curd in 5 ml distilled water. A blue colour indicates the presence of dried skim milk and the depth of colour was found to be proportional to the quantity of dried skim milk present.

Murthy and Kaylor (1971) standardized and quantitated the previous method which was suggested by Mabrouk (1966). They concluded that the minimum amount of detectable dried skim milk was 10 %.

Protein reducing value :

Heated and dried milks contain a complex reducing system involving -SH compounds, ascorbic acid, and substances associated with the browning reaction (Jenness and Patton, 1959).

In 1945 Chapman and McFarlane proposed a method involves heating the milk powder with potassium ferricyanide solution in a phthalate buffer solution at pH 5 for 20 minutes at 70°C, cooling, precipitating with trichloroacetic acid, addition of ferric chloride to an aliquot of the filtrate, and finally measurement of the intensity of the blue colour at 660 m u. A calibration curve was prepared with glutathione. Application of the method to raw and heated milks and to milk powders showed that there was an increase in the reducing value on heating: roller - dried powders gave much higher values than did spray dried powders. The ferricyanide

method gave much higher reducing values for fresh milk powders than did the alternative methods of titration with 2,6-dichlorophenolindophenol or potassium iodate.

Harland and Ashworth (1945) found that heating milk at 90°C for 5 minutes resulted in reducing substances amounting to about ten folds as those resulted from heating milk at 70°C for 30 minutes or at 75°C for one minute.

Tammisto (1951) investigated the effect of different time-temperature combinations on the formation of reducing compounds. He found that the amounts of reducing substances were on prolonging the holding time.

Cardwell and Herzer (1958) studied the factors which cause variations in the protein reducing value of fluid milk. They reported that the value of protein reducing substances in milk was greater in vat-pasteurisation than in H.T.S.T. method.

The higher the temperature on the longer than holding time the greater was the protein reducing substances. No correlation was found between butter fat