DETERMINE THE QUALITY OF RAW MILK AND FIND OUT THE SUBSTANCE WHICH AFFECT THE QUALITY.

By

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DECLARATION

The word describe in this thesis was carried out by me at the Ceylon Cold Stores Ltd and the faculty of Applied Sciences under the Supervision of Mr. D. A. M. Arasacularatna (Quality Controller Research and Development Manager, Ceylon Cold Stores Ltd) and Dr. D. B. M. Wickramaratne (Head, Department of Physical Sciences, faculty of Applied Sciences). A report on this has not been submitted to any other University for another degree.

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AFFECTIONATELY DEDICATED TO

MY EVER LOVING

PARENTS

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ABSTRACT

In Sri Lanka packeted and bottled raw milk are available in urban areas. Therefore this study was carried out to detect the quality (adulteration problem) of packeted and bottled raw milk. This adulteration problem has directly affected to the keeping quality and marketing value of that raw milk.

In this study Ceylon cold stores raw milk supplier's samples were checked for the presence of adulterants and the ordinary constituents of milk. Adulterants are one of the most important factors effecting the quality of raw milk. These quality tests includes such as fat test, total soluble solids test (density), urea detection, salt detection, sugar detection, bicarbonate detection and skim milk powder detection.

In this study I have detected some adulterants in some samples. The fat and total solids variations were observed in those adulterated samples as well as in non adulterated samples. Variations of above values in pure samples may be due to the seasonal variation, breed, feeding and milking intervals.

The quality and the self-life of bottled milk and packed milk also varies due to the improper processing, handling and storage where bacterial contamination can occur.

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CHAPTER 1

Introduction

Traditionally, quality of raw milk has been known as the exact conformance of its chemical and microbiological and microbiological specifications. In dairy industries, for the last few years, have been depending on the results of estimating of chemical contents of milk viz. Titrable acidity, fat, SNF, added water and few adulterants neutralisers, preservatives etc and microbiological qualities, viz. MBRT, TVC,spore counts, coliform counts etc, in order to control the quality.

The term quality refers to the sum total of all the features and characteristics of raw milk that bear on its customers Raw milk serves the purpose of its producers on one hand and the customers on the other, with their own options of quality, cast productivity and quality, price availability and service, respectively. In order to supply quality raw milk immediate and efficient primary chilling of raw milk obtained from healthy milch animals under hygienic conditions and maintenance of temperature profile, till it reaches the customers need to be ensured.

Good quality milk is a near perfect food unfortunately a substantial fraction of all milk contains added substances with water. If highly advanced countries do not have this problem completely under control, we can assume that it is probably worse in areas where milk control and legislation has a low priority. Besides being an economic problem, the addition of water to milk also creates a Public health hazard.

The control of adulteration is further made difficult because of the fluctuation in the composition of milk, in particular, the fat percentage. The latter is affected by a number of factors, the most import one being: irregular feed supply and in turn amount of milk produced. Milking methods and milking intervals, sucking of calf at beginning or end of milking commingling milk of different breeds or admixture of other milks.

The dishonest producers and vendors use different tactics to increase their profit. The addition of substances is the simplest way to increase the supply and is the usual choice. Skimming, i.e, removing some of the cream occurs less often because it is time consuming and awkward under primitive conditions and double adulteration.

Glucose, cane sugar, urea, salt ammonium sulphate and other substance have been encountered as additives (Mittal and Roy, 1976a, 1976b) for the purpose of masking the effects of dilution with water. Even a sensitive test like freezing point of milk fails to unmask this adultration (Dhamarajan et. al. 1953). These substances can be detected by using glucose oxidise and redox indicators or by using various instrumental techniques (Marid vicente , 1972, Reineccius et.al 1970, Ramachandra et.al 1955).

Simple methods arising out of changes in various physicochemical properties can also from the basis of such detections. Density have been noted on addition of glucose, urea and ammonia sulphate, but again the increase in density was not exactly propose to the molar concentration of the added solute. Also, rise in milk density due to glucose was greater than that due to urea and lower than that due to ammonium sulphate (Mittal and Roy, 1976a, 1976b), and was not in molar proportions. A platform test based on a rapid colorimetric method to estimate extraneous glucose in milk has been developed (Roy and Mittal 1977).

Addition of sugar to milk is a common problem in the dairy industry. Addition of 0.2% sugar to milk increase the lactometer reading by one degree at 60F. A rapid, simple and accurate method, which can be used as a platform test to detect up to 0.05% added sugar, has been reported. Sugar is hydrolysed to glucose and fructose by the enzyme invertase and the resultant glucose is estimated enzymically using glucose oxidase-peroxidase strip (Maletal.1988). The strip shows changes in colour from sky blue to green to brown, and indicates the presence of added sugar in milk (Pal .et.al., 1989). If the milk is preserved by formalin, the common resorcinol test needs some modifications, but in this method there is no interference from formalin.

Addition of colouring matter like annato along with water may be suspected when specific gravity, fat content, SNF and total solids of a milk sample would decrease without any change in the appearance of milk. Addition of common salt and water can be detected by a simple test. Sodium chloride can be added to milk up to 0.4% without affecting its normal flavour, odour and taste, while at the same time 13.06% water can be added to milk and yet its specific gravity can be maintained at almost normal.

(Shidlovskaya et al., 1974), Since it is often used to conceal the development of acidity. Preservatives like sodium bicarbonate or penicillin are added to milk to prolong its keeping quality. Non-acceptance of milks positive to clot-on-boiling (COB) prompts widespread addition of sodium bicarbonate to milk. Further, addition of sodium bicarbonate to the extent of 0.3% in milk may be of advantage to the vendor by increasing the lactometer reading by 3 degrees, or 9.9% water can be added without affecting the specific gravity. (Mishra and Dehury , 1974), .

This study was carried out at the Colombo Ceylon Cold Stores Ltd., which is supplying fresh raw milk bottles and packets to market.

OBJECTIVES

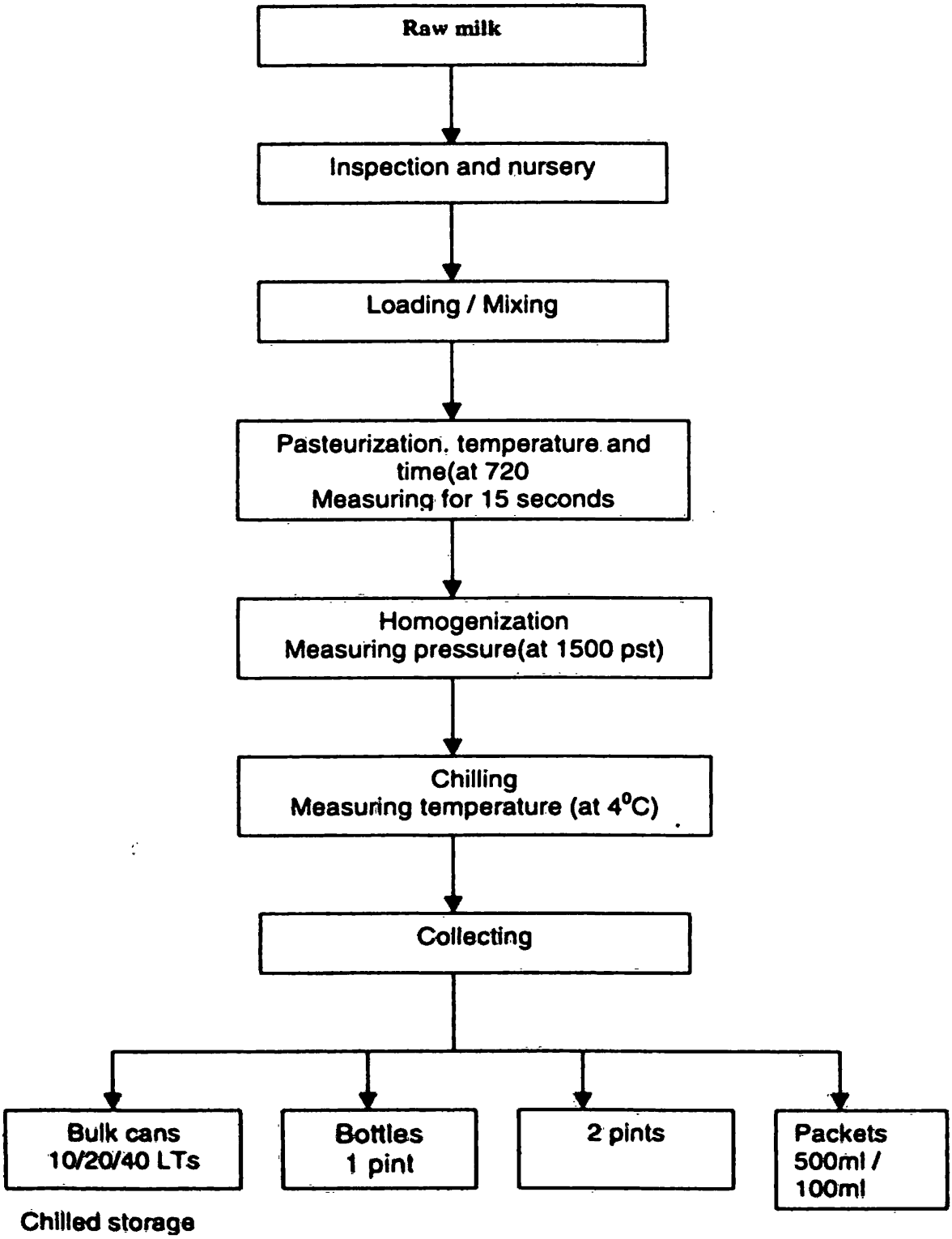
The objects of this study is to find

(a) Quality of the raw milk

(b) Adultrated substances in raw milk sample

(c) To monitor the quality of milk samples for period of two months

Figure 2.0: Plain milk processing



CHAPTER II
LITERATURE REVIEW

2.0 LITERATURE REVIEW

2.1 Milk

Milk can define different ways,

Biological: - The liquid normally secreted by female mammals for nourishment of their young.

Chemical: - A complex mixture of organic and inorganic food substance consisting of water fat, a carbohydrate proteins minerals salts, gases, some bacteria, enzyme, mineral salts gases, some bacterial enzymes and vitamins.

Legal: - The whole - clean fresh lacteral secretion obtained by the complete milking of one or more Health cows, properly fed and kept, excluding that obtained within 15 days before and 5 days after calving and Containing not less than 8.5% of solids-non-fat, and not less than 3.25% of milk fat.

(J Milk food Technology, 1971)

2.1.1 Composition and Structure of the Milk

- The role of milk in nature is to nourish and provide immunological protection for the mammalian young. Milk has been a food source for human since prehistoric times; from human, goat, buffalo sheep, yak, to the focus of this section-domesticated cow milk (genus Bos). Milk and honey are the only articles of diet whose sole function in nature is food. It is not surprising, therefore, that the nutritional value of milk is high. Milk is also a very complex food with over 100,000 different molecular species found. There are many factors that can affect milk composition such as breed variation (see introduction, cow to cow variations, herd to herd variations-including management and feed consideration, seasonal variations, and geographic variations, with all this in mind, only an approximate composition of milk can be given:

- 87.3% water (range of 85.5%--88.7%)
- 3.9% Milkfat (range of 2.4%-- 5.5%)
- 8.8% Solids-not-fat (range of 7.9-10.0%)
- protein 3.25% (3/4 casein)

Lactose 4.6%

minerals 0.65% - Ca,P,citrate,Mg,K,Na,Zn,Cl,Fe,Cu,sulfate
Bicarbonate, many others

acids 0.18%- citrate,formate,acetate,lactate,oxalate

enzymes- peroxidase, Catalase, phosphate, lipase

gases-oxygen, nitrogen

vitamins- A,C,D, thiamine, riboflavin, others

plasma = milk - fat (skim milk)

serum = plasma - casein micells (whey)

Solids-non-fat (SNF)=proteins, lactose, minerals, acids, enzymes, vitamins

Total milk solids fat+SNF. (J.Doury Science, 1962)

Not only is the composition important in determining the properties of milk, but the physical structure must also be examined. Due to its role in nature, milk is in a liquid form. This may seem curious if one takes into consideration the fact that milk has less water than most fruits and vegetables. Milk can be described as:

- an oil-in-water emulsion with fat globules dispersed in the continuous serum phase
- a colloid suspension of casein micelles,globular proteins and lipoprotein particles
- a solution of lactose, soluble proteins, minerals, vitamins other components.

Looking at milk under a microscope, at low magnification (5X) a uniform but turbid liquid is observed. At 500X magnification, spherical droplets of fat, known as globules, can be seen .At even higher magnification (50,000X), the casein micelles can be observed. The main structure components of milk, fat globules and casein micells, will be examined in more detail later.

2.1.1.1 Lactose

Lactose is a disaccharide (2 sugars) made up of glucose (which is both monosaccharede). It comprises 4.8%-5.2% of milk SNF, and 70% of whey solids. It is not as sweet as sucrose. When lactose is hydrolysed by B-D-galactosidase (lactase), an enzyme that splits these monosaccharides, the results is increased sweetness, and depressed freezing point.

One of its most important functions is its utilisation as a fermentation substrate. Lactic acid bacteria produce lactic acid from lactose, which is the beginning of many fermented dairy products. Because of their ability to metabolise lactose, they have a competitive advantage over many pathogenic and spoilage organisms.

2.1.1.2 Milk Fat

The fat content of milk is of economic importance because milk is sold on the basis of fat. Milk fatty acids originate either from microbial activity in the rumen, and transported to the secretary cells via the blood and lymph, or from synthesis in the secretory cells. The main milk lipids are a class triglycerides which are comprised of a glycerol backbone binding up to three different fatty acids. The fatty acids are composed of a hydrocarbon chain and a carboxyl group.

2.1.1.3 Protein

The primary structure of proteins consists of a polypeptide chain of amino acids residues joined together by peptide linkage, which may also be cross-linked by disulphide bridges. Amino acids contain both a weakly basic amino group, and a weakly acid carboxy group both connected to a hydrocarbon chain, which is unique to different amino acids. The three-dimensional organization of proteins, or conformation, also involves secondary, tertiary, and quaternary structures. The secondary structure refers to the spatial arrangement of amino acid residues that are near one another in the linear sequence. The alpha-helix and B-pleated sheat are examples of secondary structures arising from regular and periodic stearic relationships. The tertiary structure refers to the spatial arrangement of amino acid residues that are far apart in the linear sequence, giving rise to futher coiling and folding. If the protein is tightly coiled and folded into a somewhat spherical shape, it is called a globular protein. If the protein consists of long polypeptide chains which are intermolecularly linked, thay are called fibrous protein. Quaternary structure occurs when

proteins with two or more polypeptide chain subunits are associated.

2.1.1.3.1 Caseins

The casein content of milk represents about 80% of milk proteins. The principal casein fraction is alpha (s1) and alpha (s2)-casinos, B-casein, and Kappa-casein. The distinguishing property of all caseins is their low solubility at pH 4.6. The common composition factor is that caseins are conjugated proteins, most with phosphate group(s) esterified to serine residues. These phosphate groups are important to the structure of the casein micelle. Calcium binding by the individual caseins is proportional to the phosphate content.

The conformation of caseins is much like that of denature globular proteins. The high number of proline residues in caseins causes particular bending of the protein chain and inhibits the formation of close-packed, ordered secondary structure. As well, the lack of teritary structure accounts for the stability of caseins against heat denaturation because there is very little structure to unfold. Without a tertiary structure there is considerable exposure of hydrophobic residues. This results in strong association reactions of the caseins and renders them insoluble in water. Within the group of caseins, there are several distinguishing features based on their charge distribution and sensitivity to calcium precipitation.

α(s1)-casein

Two hydrophobic regions,containing all the proline residues,separated by a polar region, which contains all but one of eight phophate groups. It can be precipitated at very low of calcium.

α(s2)-casein:

Concentrated negative charges near N-terminus and positive charges near C-terminals. It can also be precipitated at very low levels of calcium.

β-casein

Highly charged N-terminal region and a hydrophobic C-terminal region. Very

amphiphilic protein acts like a detergent molecule.Self association is temperature dependent; will form a large polymer at 20C but not at 4C. Less sensitive to calcium precipitation.

κ-casein:

Very resistant to calcium Precipitation, stabilizing other caseins. Rennet clevage at the phe 105-Met 106 bond elliminates the stabilizing ability, leaving a hydrophobic portion, par-kappa-casein, and a hydrophilic portion called kappa-casein glycomacropeptide (GMP), or more accurately, caseinomacropeptide(CMP).

Whey Proteins

The proteins appearing in the supernatant of milk after precipitation at pH 4.6 are collectively called whey proteins. These globular proteins are more water soluble than caseins and are subject to heat denaturation. Native whey proteins have good gelling and whipping properties. Denaturation increases their water holding capacity. The principle fractions are B-lactoglobulins,alpha-lactalbumins,bovine serum albumin (BSA),and immunoglobulins(Ig).

β-Lactoglobulins:

(MW-18,000) This group, including eight genetic variants,comprises approximately half the total whey proteins. It has two internal disulfide bonds and one free thiol group.The conformation includes condiderable secondary structures and exists naturally as a noncovalent linked dimer. At the isoelectric point (Ph 3.5to5.2), the dimers are futher associated to octamers but at pH below 3.4, thay are dissociated to monomers.

α-Lactalbumins

(MW-14,00) These proteins contain eight groups,all involved in internal disulfide bonds, and four tryptophan residues. It has a highly ordered secondary structure, and a compact, spherical tertiary structure. Thermal denaturation and pH.

(J. Milk food technol, 1965)

2.2.1.4 Enzymes

Enzymes are a group of proteins produced by living organisms. They have the ability to trigger chemical reactions and to affect the course and speed of such reactions. Enzymes do this without being consumed. They are therefore sometimes called biocatalysts.An enzyme probably takes part in a reaction, but is released again when it has completed its job.
The action of enzymes is specific; each type of enzyme only catalyzes one type of reaction.

Two factors which strongly influence enzymatic action are temperature and Ph. As a rule enzymes are most active in an optimum temperetùre range between 25 and 50C. The activity drops if the temperature is increased beyond optimum,ceasing altogether somewhere between 50 and 120C . At these temperatures the enzymes are more or less completely destroyed (inactivated). The temparature of inactivation varies from one type of enzyme to another a fact, which has been widely utilised for the purpose of determining the degree of pasteurisation of milk. Enzymes also have their optimum pH ranges; some function best in acid solutions, others in an alkaline environment.

The enzymes in milk come either from the cow's udder or from bacteria. The former are normal constituents of milk and are called original enzymes. The former are normal constituents of milk and are called original enzymes. The latter,bacterial enzymes,vary in type and abundance according to the nature and size of the bacterial population. Several of the enzymes in milk are utilized for quality testing and control. Among the more important ones are peroxidase catalase, phosphatase and lipase.

Milk contains both indigenous and exogenous enzymes. Exogenous enzymes mainly consist of heat-stable enzymes produced by psychrotrophic bacteria: lipases, and proteinase. There are many indigenous enzymes that have been isolated from milk. The most significant group are the hydrolases.

Lipoprotein lipase(LPL): A lipase enzyme splits fats into glycerol and free fatty acids. This enzyme is found mainly in the plasma in association with casein micells. The milk fat is protected from its action by the FGM. If the FGM has been damaged, or if certain cofactors(blood serum lipoprotein)
are present, the LPL is able to attack the lipoprotein of the FGM. Lipolysis may be caused in this way.

Plasmin

Plasmin is a proteolytic enzyme; it splits proteins. Plasmin attacks both B-casein and alpha(s2)-casein. It is very heat stable and responsible for the development of bitterness in pasteurised milk and UHT processed milk. It may also play a role in the ripening and flavour development of certain cheeses, such as Swiss cheese.

Phosphates

Phosphates have the property of being able to split certain phosphoric-acid esters into phosphoric acid and the corresponding alcohols. The presence of phosphates in milk can be detected by adding a phosphoric-acid ester and a reagent that changes colour when it reacts with the liberated alcohol. A change in colour reveals that the milk contains phosphatase.Phosphatase is destroyed by HTST pasteurization.
So the phosphates test can be used to determine whether the pasteurisation temperature has actually been attained. The routine test used in dairies is called the phosphate test according to sharer.

The phosphate test should preferably be perfumed immediately after the heat treatment. Failing that, the milk must be chilled to below +5C and kept at that temperature until analysed. The analysis should be carried out the same day, otherwise a phenomenon known as reactivation may occur, i.e. an inactivated enzyme becomes active again a positive test reading cream is particularly susceptible where this is concerned.

Peroxides

Peroxides transfers oxygen from hydrogen peroxide (H2O2) to other readily oxidizable substances. This enzyme is inactivated if the milk is heated to 80C for a few seconds, a fact that can be used to prove the presence or absence peroxides in milk and thereby check whether or not a pasteurisation temperature above 80C has been reached. This test is called starch's peroxides test.

Catalase

Catalase splits hydrogen peroxide into water and free oxygen. By determining the amount of oxygen that the enzyme can release in milk, it is possible to estimate the catalase content of the milk and learn weather or not the milk has come from an animal with a healthy udder. Milk from diseased udders has a high catalase content, while amount. There are however many bacteria which produce this kind of enzyme. Catalase is destroyed by ordinary HTST pasteurisation (75 C for 60 seconds).

Lactase

Lactose is a disaccharide (2 sugars) made up of glucose and galactose (which are both monosaccharides).It comprises 4.8-5.2% of milk, 52% of milk SNF, and 70% of whey solids. It is not as sweet as sucrose. When lactose is hydrolysed by B-D-galactosidase (lactose),an enzyme that splits these monosaccharides, the results is increased sweetness, and depressed freezing point.

One of its most important functions is its utilisation as a fermentation substrate. Lactic acid bacteria produce lactic acid from lactose, which is the beginning of many fermented dairy products. Because of their ability to metabolise lactose, they have a competitive advantage over many pathogenic and spoilage organism.

Some people suffer from lactose intolerance; they lack the lactase enzyme,hence they cannot digest lactose, or dairy products containing lactose. Crystallization of lactose occurs in an alpha form which commonly takes a tomahawk shape. This results in the defect called sandiness. Lactose is relatively insoluble which is a problem in many dairy products, ice cream, sweetned condensed milk. In addition to lactose, fresh milk contains other carbohydrates in small amounts, including glucose and oligosaccharides.

2.1.1.5 Vitamins

Vitamins are organic substances essential for many life processes. Milk includes fat soluble vitamins A,D,E, and K. Vitamin A is derived from retinal and B-carotene. Because milk is an important source of dietary vitamin A,fat reduced products which have lost vitamin A with the fat, are required to supplement the product with vitamin A.

Milk is also an important source of dietary water soluble vitamins:

- B1-thaimine
- B2-riboflavin
- B6-pyridoxine
- B12-cyanobalamin
- niacin
- pantothenic acid

There is also small amount of vitamin C (ascorbic acid) present in raw milk but is very heat-labile and easily destroyed by pasteurisation.

(Journal of food Science, 1942)

Table 2.1.1.5 The vitamins contents of milk.

Vitamin	Contents per litre
A (ug RE)	400
D (iu)	40
E (ug)	1000
K (ug)	50
B1 (ug)	450
B2 (ug)	1750
Niacin (ug)	900
B6 (ug)	500
pantothenic acid (ug)	3500
Biotin (ug)	35
Folio acid (ug)	55
B12 (ug)	4.5
C (mg)	20

2.1.1.6 Minerals

All 22 minerals considered to be essential to the human diet are present in milk. These include three families of salts:

1. Sodium (Na), Potassium (K) and Chloride (Cl): These free ions are nagatively correlated to lactose to maintain osmotic equilibrium of milk with blood

2. Calcium (Ca), Magnesium (Mg), Inorganic Phosphorous (p (I)), and Citrate: This group consist of 2/3 Ca, 1/3 Mg,1/2P(I), and less than 1/10 citrate in colloidal (nondiffusible) form and present in the casein micelle.

3. Diffusible salts of Ca, Mg, citrate, and Ca++, and HPO_4^{--}:- These salts are very pH dependent and contribute to the overall acid-base equilibrium of milk.

The mineral contents of fresh milk is given below:

Table 2.1.1.6: The mineral contents of fresh milk

Mineral	Content per litre
Sordium (mg)	350-900
Potassium (mg)	1100-1700
Chloride (mg)	900-1100
Calcium (mg)	1100-1300
Maganese (mg)	90-140
Phosphorus (mg)	900-1000
Iron (ug)	300-600
Zinc (ug)	2000-6000
Copper (ug)	100-600
Manganese (ug)	20-50
Iodine (ug)	260
Fluoride (ug)	30-220
Selenium (ug)	5-67
Cobalt (ug)	0.5-1.3
Chromium (ug)	8-13
Molybdenum (ug)	18-120
Nickel (ug)	0-15
Silicon (ug)	750-7000
Vanadium (ug)	tr-310
Tin (ug)	40-500
Arsenic (ug)	20-60

2.2. Physical Properties

2.2.1 Density

The density of milk products is used for the following:

- to convert volume into mass and vice versa
- to estimate the solids content
- to calculate other physical properties (e.g kinematic viscosity)

Density, the mass of a certain quantity of material divided by its volume, is dependent on the following

- temperature at the time of measurement
- temperature history of the material
- composition of the material (especial the fat content)
- inclusion of air (a complication with more viscous products)

With all of this in mind, the density of milk varies within the range of 1027 to 1033 kg m(-3) at 20 °C.

The following table gives the density of various fluid dairy products as a function of fat and solids-not-fat (SNF) composition:

Table 2.2.1: Density of various dairy products.

Product	Product composition		Density			
	Fat (%)	SNF(%)	4.4 °C	10°C	20 °C	8.9°C
Producer milk	4.00	8.95	1.035	1.033	1.030	1.021
Homogenized milk	3.6	8.6	1.033	1.032	1.029	1.022
Skim milk pkg	0.02	8.9	1.036	1.035	1.033	1.026
Fortified skim	0.02	10.15	1.041	1.040	1.038	1.031
Half and half	12.25	7.75	1.027	1.025	1.020	1.010
Half and half, fort	11.30	8.9	1.031	1.030	1.024	1.014
Light cream	20.00	7.2	1.021	1.018	1.012	1.000
Heavy cream	36.60	5.55	1.008	1.005	0.994	0.978

2.2.2 Viscosity

Viscosity of milk and milk products is important in determining the following:

- the rate of creaming
- rates of mass and heat transfer
- the flow condition in dairy process

Milk and skim milk, excepting cooled raw milk, exhibit Newtonian behaviour, in which the viscosity is independent of the rate of shear. The viscosity of these products depends on the following.

- Temperature
- cooler temperature increase viscosity due to the increased voluminosity of casien micelles
- Temperature above 65C increase viscosity due to the denature of whey proteins
- PH an increase or decrease in pH of milk also cause an increase in casein micelle voluminosity cooled raw milk and cream exhibit non-Newtonian behaviour in which the viscosity is dependant on the sheer rate. Agitation may cause partial coalescence of the fat globules (partial churning) which increase viscosity. Fat globules that have under gone cold agglutination may be dispersed due to agitation, causing a decrease in viscosity.

2.2.3 Freezing Point

Freezing point is a colligative property which is determined by the molarity of solutes rather than by the percentage by weight or volume. In the dairy industry, freezing point is mainly used to determine added water but it can also been used to determine lactose content in milk,estimate whey powder content in skim milk powder,and to determine water activity of cheese. The freezing point of milk is usually in the range of -0.512 to -0.550C with an average of about -0.522C.

Correct interpretation of freezing point data with respect to added water depends on a good understanding of the factors affecting freezing point depression. With respect to interpretation of freezing points for added water determine, the most significant variables are the nutritional status of the herd and the access to water. Under feeding causes increased

freezing points occur after consumption of large amounts of water because milk is iso-osmotic with blood. The primary sources of non-intentional added water in milk are water in milk are residual rinse water and condensation in the milking system.

2.2.4 Acid-Base Equilibrium

Both titrable acidity and pH are used to measure milk acidity. The Ph of milk at 25C normally varies within a relatively narrow range of 6.5 to 6.7. The normal range for titrable acidity of herd milks is 13-20 mmol/l. Because of the large inherent variation, the measure of titrable acidity has little practical value except to measure changes in acidity (eg.during lactic fermentation) and even for this purpose, pH is a better measurement.

There are many components in milk, which provide a buffering action. The major buffering groups of milk are casinos and phosphate.

2.2.5 Optical Properties

Optical properties provide the basis for many rapid, indirect methods of analysis such as proximate analysis by infrared absorbency or light scattering. Optical properties also determine the appearance of milk and milk products. Light scattering by fat globules and casein micelles causes milk to appear turbid and opaque. Light scattering occurs when the wavelength of light is near the same magnitude as the particle. Thus, smaller particles scatter light of shorter wavelength. Skim milk appears slightly blue because casein micelles scatter the shorter wavelengths of visible light (blue) more than the red. The carotenoid precursor of vitamin A,B carotene, contained in milk fat, is responsible for the 'creamy' colour of milk. Riboflavin imparts a greenish colour to whey.

Refractive index (RI) is normally determined at 20C with the D line of the sodium spectrum. The refractive index of milk is 1.3440 to 1.3485 and can be used to estimate total solids.

2.2.6 Taste and odour

Milk properly produced has a bland slightly sweet flavour and a faint

characteristic odour. Both are affected by feed of cow, improper cleaning of utensils, development of bacteria and acidity, exposure to copper and iron ventilation of udder, ketosis, etc. Such feeds as garlic,or wild onion and even silage when fed. Before milking will always affect the milk flavour. Pasteurisation causes a hardly noticeable cooked flavour.

2.2.7 Colour

Normal milk is yellowish white in colour. Largely the casein contributes the white colour but the fat emulsion also produces a whitish effect. The yellow comes largely from the colour of the fat globules but also somewhat from the colour of the serum. (Whey is yellowish green in colour)

2.2.8 Specific gravity

The term as applied to milk means the weight of a given volume of milk at 60F compared with the weight of the same volume of water also at 60F.

1 gal of water weighs 8.33lbs
1 gal of milk weighs 8.60lbs=1.032

Milk therefore is 1.032 times as heavy as water. Specific gravity varies with temperature and for milk is always taken at 15C (60F) or corrected to 15C (60F). The average specific gravity of milk is 1.032 but normal herd milk will vary from 1.029-1.034 and individual cows milk from 1.028-1.036.

Any milk falling under the lower figure is suspicious of being watered especially if the fat content is low for the bred and season of the year.Specific gravity is determined with a lactometre which is hydrometer similar in all respect to those used in other solutions (Battery tester etc.). The lactometer is graduated from 15-40 in units termed lactometer degrees. Lactometre degrees are simply the last two figures of the specific gravity. Therfore a reading of 31.5 on the lactometre is equivalant to a specific gravity of 1.0315.

In the metric system of weights and measures, 1cc of water weighs 1grm. The specific gravity of a liquid can, therefore, be used in obtaining the weight from the volume. Thus,

250cc of milk having a specific gravity of 1.032 would weigh 250*1.032 or 258 grams.

The specific gravity of milk is also used in calculating the percent T.S from the fat test.

$$\frac{\text{Lactometre reading} + 1.2\,(\%\text{ fat})}{4} = \%\ \text{T.S}$$

2.3 Quantitative Analysis of Milk

The following estimation are useful in finding out the quality of milk and Adultration of milk and such are carried on in laboratories.

(1) Specific Gravity
(2) Fat
(3) Total Solids
(4) Acidity
(5) Lactose
(6) Mineral matter
(7) Adulteration test

2.3.1 Total solids in Milk

The entire residue left after complete evaporation of water from milk is termed total solid or dry matter. Total solids include fat, protains,lactose and mineral matter of milk. The amount of solid matter in milk varies with in considerable limits and is greatly affected by animal breed, health and nutrition. Total solids are comprised 11%-13% of milk.

(Journal of Food Science val 10)

Methods

(1) Gravimetric method
(2) Calculation method
(3) Richmond's milk scale

Gravimetric Method

Accurately weigh a clean dry flat bottom porcelain dish. Pipette 5ml of the well mixed milk. Sample into the dish and weigh. Add few drops of Acetone keep the

mixture on water bath and allow evaporating. Transfer the partially dried sample on oven (at 100C) and Keep until constant weigh. Transfer the procelain dish to a desiccator and allow to cool. Weigh the dish at room temperature Express the percent of total solids in the given sample.

Calculation Method

Total solids 0.25G+1.2F+0.14

Where G-specific gravity in lactometre degrees at 60F
F-% fat

Richmond Method

(1) Lactometre Reading
(2) Temperature
(3) Fat content in percentage

The observed lactometre reading should be placed opposite the little arrow at 60 F on temperature scale. The lactometre reading is found opposite the line indicating the observed temperature of milk. This would give the lactometre reading at 60F.

2.3.1 Fat

Fat is more frequently determined in milk and its products than any other constituent; this is because it is the basis of most legal standard and largely controls palatability, general quality and economic value.

By the adjustment of the milk pipette to 10.94ml the Gerber test has been made more accurate for milk of 3.6% fat content and this modification has now has been generally accepted.

2.3.3 Titrable Acidity in Milk

In dairy chemistry two kinds of Acidity are reconised.They are apparent acidity and real acidity. Apparent acidity in fresh milk due to acid phosphate, casein and C02 present in it. The real acidity is formed due to production of mainly lactic acid by lactic acid bacteria ferment in milk. The Ph of fresh milk changes from about 6.6-4.3 during fermentation. The acidity of milk is ususlly determined by a direct acid base titration.

2.3.4 Adulterants

An adulterants whether added to food or drug is properly defined as a substance that makes a product inferior or impure. Adulterants differ from and additive in that it does not improve a food and is often added with the intention to defraud.

(J.Dairy Science, 1975)

2.3.5 Adulteration of milk

Milk commonly adulterated with water, starch or removal of fat addition of addition of milk powder.

Fat shows the greatest variation in milk consequently solids-non-fat is determined and the value for a sample of milk is close to 7.5 -10.6%. The bottom of the range should be surely a case of adulteration. Milk serum or whey that portion of the milk from which both fat an casein have been removed is constant in composition and analysis of it is often used in attempting to detect watering. If milk has been watered the solids are present in lower concentration and the specific gravity will be closer to water than for pure milk. Lactometre is used to find out the specific gravity. The normal specific gravity. The normal specific quality of milk is 1.03.

One of most reliable physical constants of milk is its freezing point. The presence of dissolve substance, the salts, the lactose and other molecules depress the freezing point of milk below 0C. Average value is -0.55C milk which has been watered will have freezing point closer to zero.

Skimming of milk or the addition of skimmed milk to ordinary milk does not change the amount of the any components expect fat. It can be detected by calculating the ratio of the fat to protein lactose solids or solids non-fat. Law prohibits preservative in milk.

Adulteration can be done different ways.

(1) Removal of fat by skimming
(2) Addition of separated milk or skim milk towel milk.
(3) Addition of separated milk or skim milk to whole milk

(4) Addition of starch,salt,sugar,urea bicarbonate for raising density and prevent the detection of added water by lactometre reading

To ensure the supply of unadultrated milk consumers various quality control test are performed at dairy farms milk collection centres and milk plants. Chemical analysis of milk is required to ensure that minimum compositional standards and that the milk is free from adulterants and other contaminants. Analysis is usually carried out before and after processing

2.3.5.1 Sugar Adulteration

Sugar (cane sugar) also one of the major adulteration of the milk. Normally milk contents lactose sugar when the supplier added water to milk density will rise , to prevent the detection of water they are adding cane sugar (sucrose) to milk . It will increase the solid non fat value also.

Concentration of reducing sugars can be determined semi-quantitatively using Benedict's reagent and range of colour standards. Quantitative estimations of glucose concentration may be determined conveniently. Using suitable test strips,such as Diabar 5000. The concentration of sucrose can be estimated by first adding a drop of 10% invertase (sucrose) concentrate 2 cm 3 of the solution to be tested and leaving for 30minutes at room temperature. After enzyme treatment, the solution is tested for the presence of reducing sugar. This method is preferable to acid hydrolysis.

2.3.5.2 Bicarbonate Adulteration

To ensure the supply of adulteration dirty farms milk collection centres milk plants. The acts of addition of neutralisation like carbonates/bicarbonates on the TA of milk and the comparative adding of raw milk.

The frequency distribution of the milk samples according to pH, TA and adulteration with carbonates or bicarbonates. Neutralisers in the form of lime water or sodium bicarbonates, may be added neutralise developed acidity before milk is processed such a practise is not permissible. The presence of these is detected by the following methods.

(1) Bromothymol blue test
(2) Rosalic acid test.

2.3.5.3 Skim Milk Powder Adulteration

It may be profitable to adulterate milk not only with water but with spray dried whole or skim milk powder because such powder can often be bought at a price which is on equivalence cheaper than retain milk. This addition is sometimes called toning. Adultration of milk with small quantities of reconstituted good quality spray dried milk powder is difficult to estabilish, the larger quantity, the easier become its detection heat treatment of the milk. Heat treatment of the milk greatly increases the difficulty of proving this type of adulteration.

The following are the best available methods for the purposes:

(1) Microscopic examination for sediment and Streptococcus thermophillus
(2) Gas chromatographic detection of aldols and other compounds formed when milk is dried
(3) Sensory Examination
(4) Measurement and Examination of Centrifuged deposit
(5) Consideration of ratio of fat to SNF
(6) Comparison of colony counts with direct microscopic method
(7) Chemical Method

(J.Dairy Science, 1965)

CHAPTER III

MATERIALS AND METHODS

3.0 Materials and Methods

- For this testing form each suppliers samples were collected
- From each supplier three samples were collected randomly

3.1 Sample Collection

- Each sample collected from three jars

3.1.1 The milk samples were examined

(1) Total soluble solids

(2) Fat

(3) Solids- not- fat

(4) Adulteration test.

(I) Urea

(ii) Bicarbonate

(iii) Skim milk powder

(iv) Salt

(v) Sugar

3.2 Detection of Total Soluble Solids

3.2.1 Preparation of Materials

The following material were used for the testing.

(1) Three flat bottom dishes

(2) Electronic balance

(3) Oven

(4) Pipettes

3.2.2 Method

The empty flat bottom dishes were washed properly and kept in oven condition for 10 minutes. Then the dishes were kept in the desiccrator and allow cooling. Then the clean dry empty dishes were numbered 1-3 and weighted accurately. By using the pipette 5ml of samples were weighted again with milk samples. They were placed 2hr on a waterbath without cover .After that the dishes were transfer to a well-ventilate oven at 98-100 C for 1hr. After that the dishes were transfer it to dessiccator and allowed to cool 15 minutes.Then they were weighted again.

Calculation:-

Weight of empty dish = W1

Weight of dish with milk = W2

Weight after evaporation of milk in the dish = W3

$$\text{Total solids} = \frac{W3 - W1}{W2 - W1} * 100$$

$$= \frac{\text{Dry weight}}{\text{Raw weight}} *$$

3.3 Determination of Fat

3.3.1 Materials

The following materials were used in the testing of fat content.

(1) Three Gerber Tubes.
(2) C H_2SO_4
(3) Amyl Alcohol.
(4) Milk Samples
(5) Pipettes
(6) Measuring cylinder

3.3.2 Method

Gerber tubes were numbered 1-3.then 10 ml of H_2SO_4 (98%) was poured into each Gerber tubes by using pipettes. Then 10.94ml of milk samples were added without mixing the acid milk layers.After that 10ml of amyl alcohol was added stopper the butyrometre and shake until the curd dissolves. Centrifuge the contents of the butyrometre at 1100 r.p.m.(rotation perminutes) for 4 minutes.

3.4 Adulteration Testing

3.4.1 Urea Detection

3.4.2 Preparation of Material

The following materials were used for the testing1) Pipettes

(1) Test tubes
(2) Water bath
(3) Motar
(4) Pistille
(5) Funnel
(6) Oven
(7) Dropper
(8) Volumetric Flask
(9) Electronic Balance

3.4.3 Preparation Of Urease Solution

Ten gram of soyabean seeds were measured and they were allowed to germinate. Then germinate seeds were grind to a thin paste. Then 5gr of thin paste was weighted and mixed with 90ml of distilled water. Mixed solution was filtered and added with 3% of 10ml potassium Hydrogen phosphate potassium Hydrogen Phosphate .

3.4.4 Preparation of Reagent

Three grams of potassium hydrogen phosphate was measured and dissolved in 100ml of distilled water.

3.4.5 Indicator Preparation

0.05 g of phenol red was dissolved in a mixture of 5ml N/10 $Na^{O}H$ and 10ml of distilled water. It was dissolved using gentle heat.

3.4.6 Preparation of N/10 NaOH solution.

4 g of $Na^{O}H$ was weight and dissolved in 100ml of water.

3.4.7 Preparation of N/10 HCL

8.73 g of HCL was weighted and added with1000ml of distilled water by using volumetric flask.

3.4.8 Method

Eight test tubes were numbered and prepared for the detection of urea. 0.001,0.005,0.01,0.05,0.1gr of urea were weighted and put into the test tubes. Three test tubes were taken without put urea.5ml of suspected milk samples was pour into each test tubes and 5ml of urease solution was added. Mixed properly and incubated at 40°C for 15 minutes. After that test tubes were taken out and 2 drops of phenol red solution was added along the walls of the test tubes.The pink coloured ring showed presence of urea.

3.5 Bicarbonate Detection

3.5.1 Preparation of Material

(1) Test tubes
(2) Graduated Pipettes
(3) Electronic balance
(4) Bromothymol blue indicator
(5) $NaHCO_3$

3.5.2 Preparation of reagent

One of Bromothymol blue was weighted and dissolved in 5ml of ethyl alcohol then it was diluted with distilled water upped 100ml.

3.5.3 Procedure

From each three sample 20ml of milk was taken and pour into eight test tubes. Five test tubes were taken separately and 0.001,0.005,0.01,0.05,0.1 grams of $NaHCO_3$ were added. Mixed thoroughly. 1ml of Bromothymol blue was added to each test tube by using graduated pipettes. Then the samples were allowed to stand for 5 minutes.Blue colour shows presence of $NaHCO_3$.

3.6 Detection of Salt

3.6.1 Material

(1) Test tubes
(2) Pipettes (1ml graduated pipette)
(3) Electronic balance
(4) N/20 $AgNO_3$
(5) 10% $K_2Cr_2O_7$
(6) Milk samples

3.6.2 Preparation of Reagent

Ten grams of $K_2cr_2O_7$ was measured and dissolved in 100ml of water. It was gently heat when it was dissolved.

3.6.3 Method

Test tubes were numbered 1-8. They prepared for salt testing. Five test tubes were taken separately.0.001, 0.005,0.01,0.05.0.1 g of salt were measured and put into the test tubes. Then 1ml of milk samples were pour into each test tube by using pipetts. and 1ml of N/20 $AgNo_3$ solution was added to that.Then after that 2drops of 10% $K_2cr_2O_7$ solutions was added and that samples were shaken gently and colours were observed.

3.7 Sucrose detection

3.7.1 Materials

(1) Boiling tubes
(2) Pipettes
(3) Pasteur Pipette
(4) Boiling water bath
(5) Test tube holder
(6) Sugar
(7) 20% Alfa napthol
(8) C Hcl

3.7.2 Preparation of Reagent

20grams of Alfanapthanol was weighted and dissolved in 100ml of Alcohol.

3.7.3 Method

Eight test tubes were taken and prepared for sugar testing. Five test tubes were taken separately and put into 0.001,0.005,0.01,0.01,0.05 g of sugar each test tube. Then 2 drops of milk samples were added to each test tube. Then 1 drop of Alfanapthaol and 3ml of CHcl were added. Those Test tubes were kept on the water bath for exactly 10 seconds.Then after that test tubes were cooled under a running tab and the colours were noted.

3.8 SKIM MILK POWDER DETECTION

3.8.1 Material

(1) Boiling tube
(2) Graduated pipette
(3) Milk Samples
(4) Boiling water bath
(5) 4% Dodeca molybdophoric acid
(6) 4% acetic acid
(7) Skim milk powder
(8) Test tube holder

3.8.2 Method

Test tubes were numbered 1-8 and prepared for testing. Five test tubes were taken separately.0.001, 0.005,0.01,0.05,0.1 grams of skim milk powder were weighted and put into the test tubes.20ml of milk samples were poured into each test tube by using pipettes. Then 2ml of 4% acetic acid was added to each samples by using pipette.Then the samples were allowed to curd 10-15 minutes. 2gr of curd was weighted from each samples and put into boiling tubes. Then 5ml of water added with each samples and diluted.Then after that 4%

dodeca molybdophoric acid was added and samples were kept on the water bath for few minutes.Then samples were cooled under rumming tab and coloured were noted.Blue particles inside the samples shows that samples adultrated with skim milk powder.

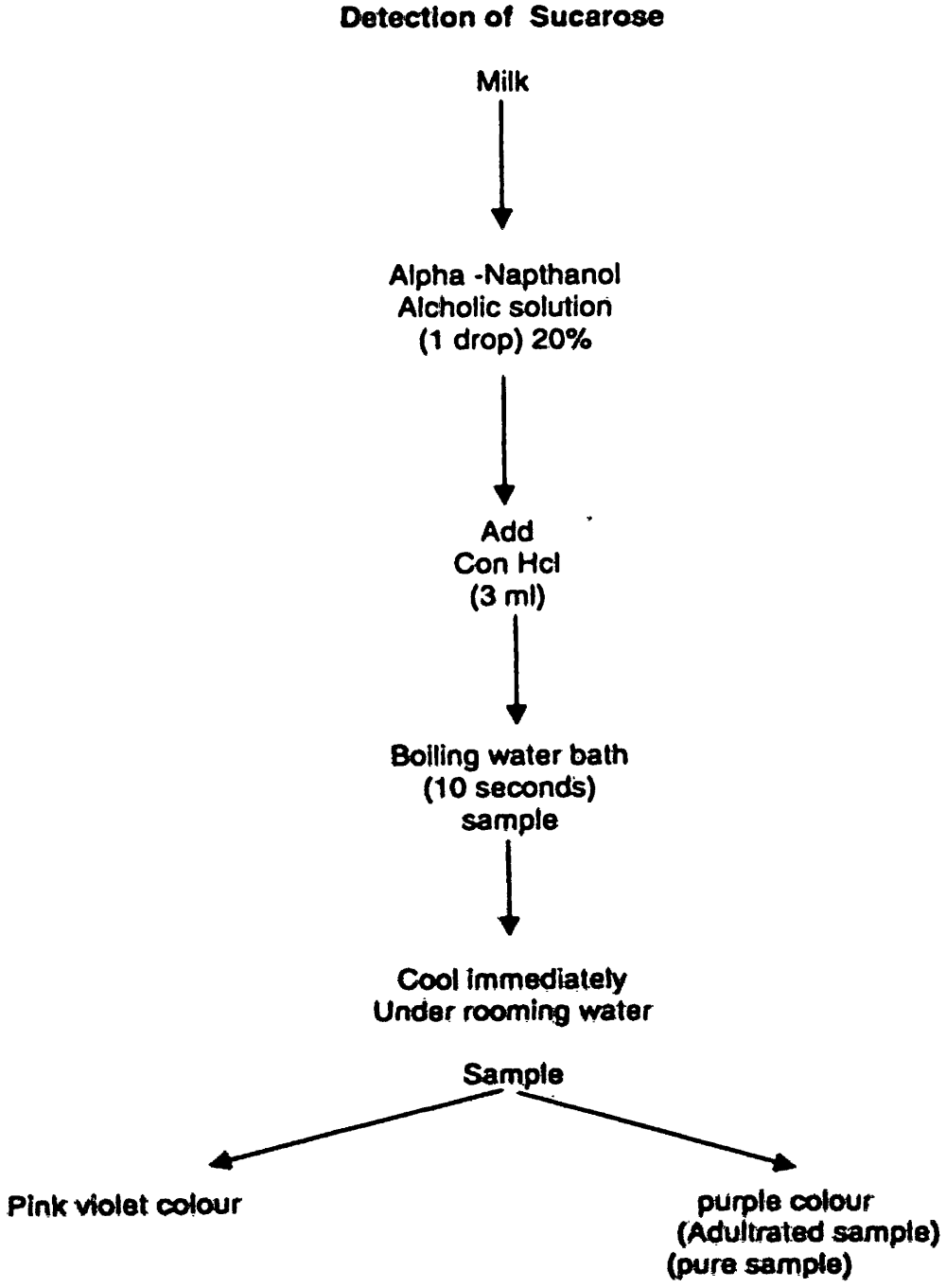


Figure 3.4

Detection of salt.

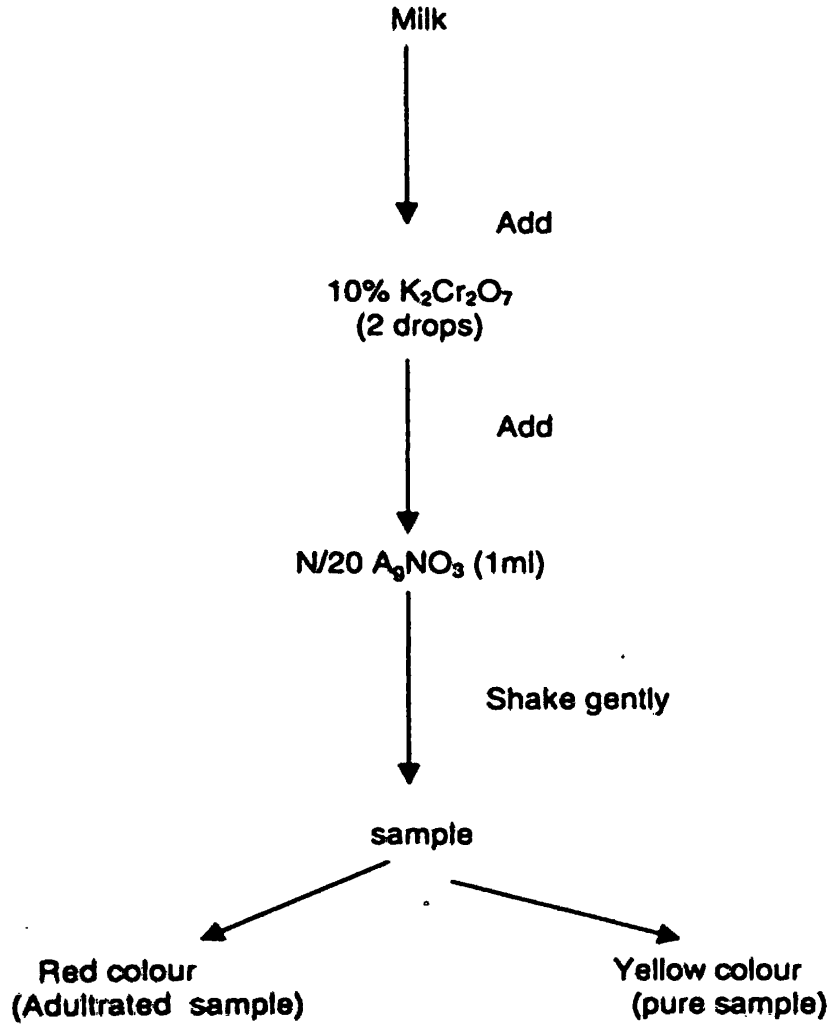


Figure 3.5: Detection of salt.

Detection of skim milk powder

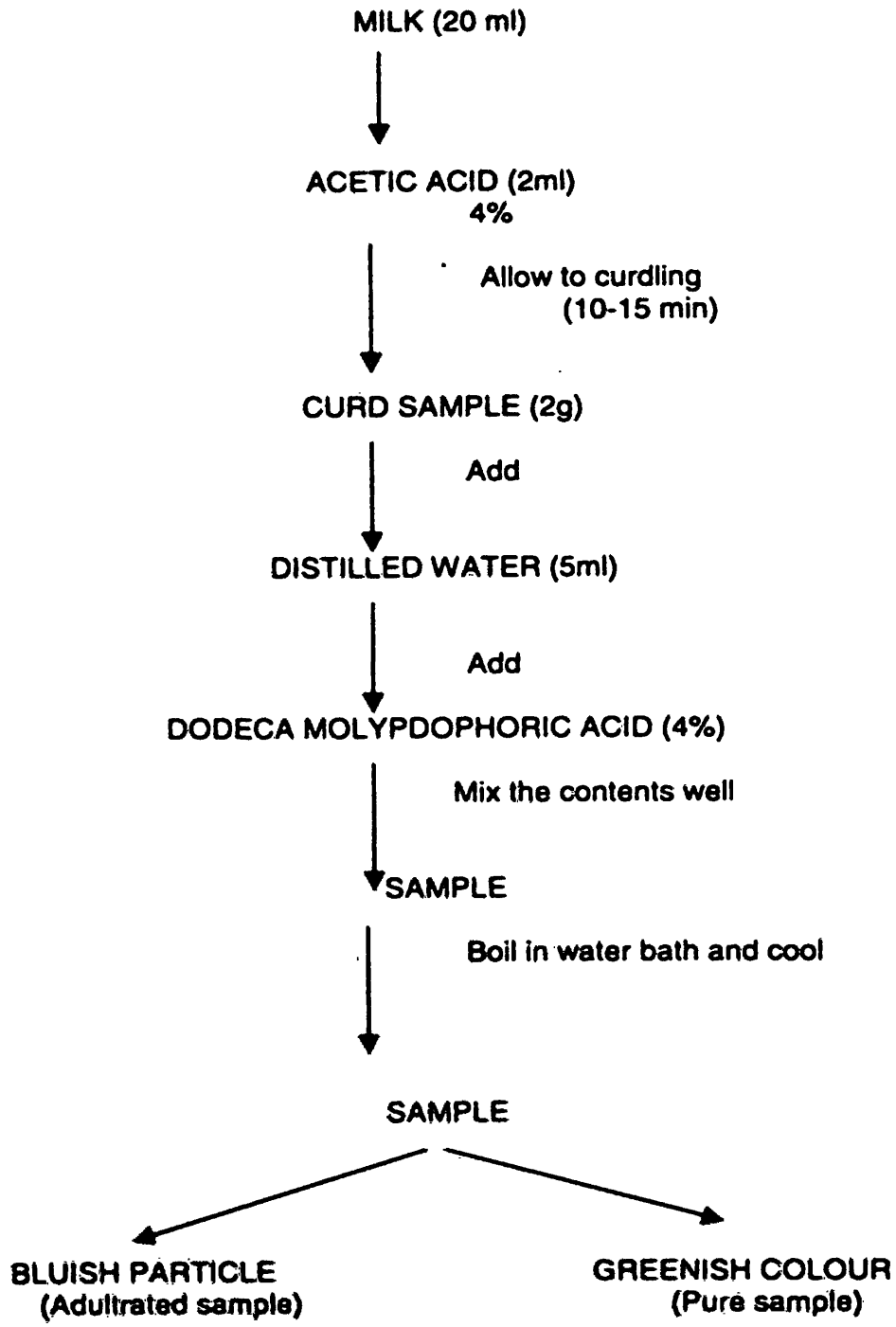


Figure 3.6: Detection of skim milk powder.

DETECTION OF UREA

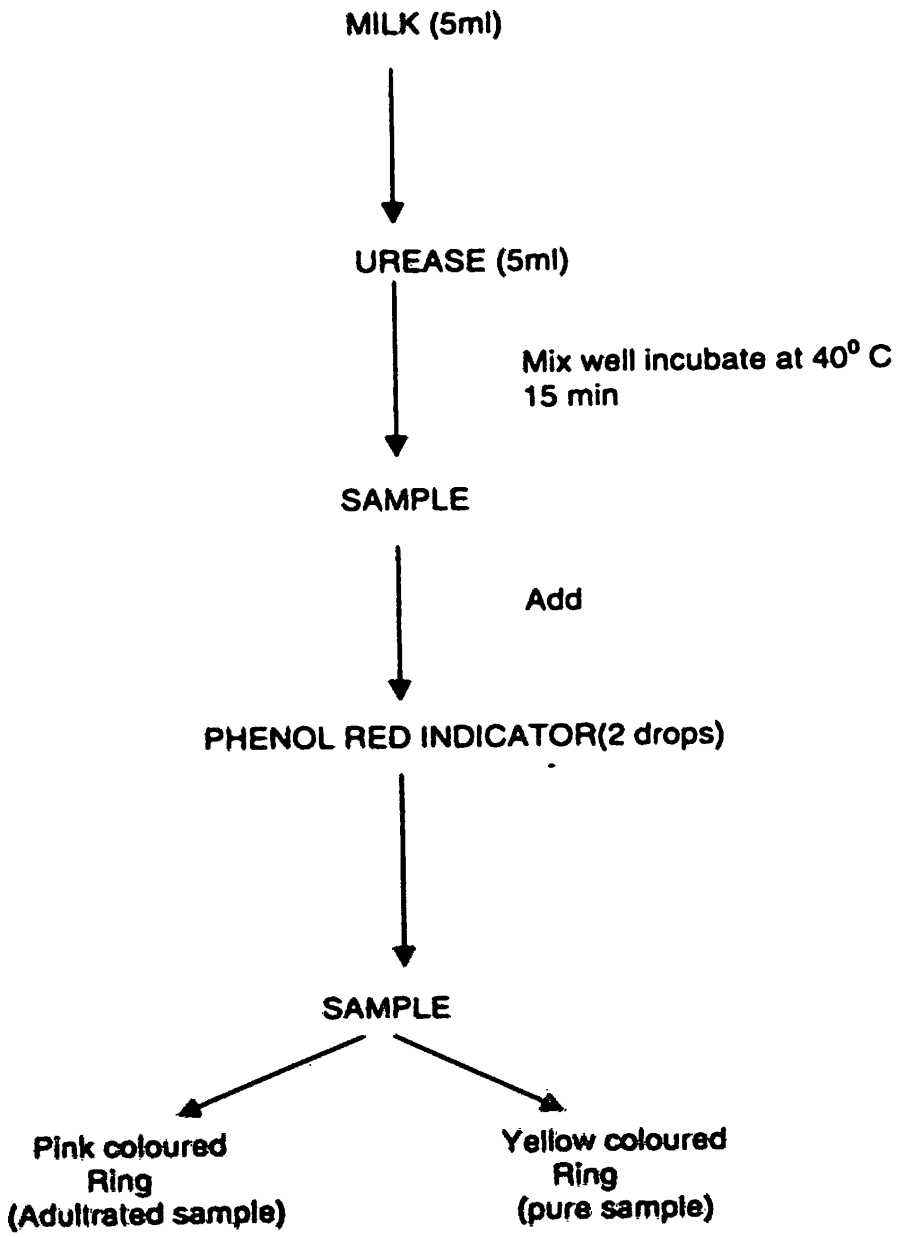


Figure 3.7: Detection of urea.

CHAPTER IV

RESULTS AND DISCUSSION

4.0 Results and Discussion

4.1 Results

Table 4.1 Examination Held On 22.07.2000

Sample	Fat (%)	T.S.S (%)	S.N.F (%)
D1	2.4	8.4	6
D2	2.3	8.6	6.3
D2	2.3	9.0	6.7
N1	3.3	10.8	7.5
N2	3.5	10.8	7.3
N3	3.5	11.2	7.7

D- Diary farm Milk samples

N- Nel farm milk Samples

Table 4.2 Adultration Examination.

Sample	Salt	Sugar	Urea	Bicarbonate	Skim milk Powder
D1	-ve	-ve	0.01	0.01	-ve
D2	,,	,,	0.01	0.01	,,
D3	,,	,,	0.01	0.01	,,
N1	,,	0.1	-ve	-ve	,,
N2	,,	0.1	-ve	-ve	,,
N3	,,	0.1	-ve	-ve	,,

Table 4.3 EXAMINATION HELD ON 29.07.2000

Sample	Fat (%)	T.S.S(%)	S.N.F(%)
D1	3.1	10.2	7.1
D2	3.4	11.4	8.0
D3	3.3	11.4	8.1
N1	3.6	10.6	7.0
N2	3.5	10.8	7.3
N3	3.2	10.8	7.6

Table 4.4 Adultration Examination

SAMPLE	Salt	Sugar	Urea	Bicarbonate	Skim milk powder
D1	-ve	-ve	0.01	-ve	-ve
D2	,,	,,	0.01	,,	-ve
D3	,,	,,	0.01	,,	-ve
N1	0.001	,,	-ve	0.1	-ve
N2	0.001	,,	,,	0.1	-ve
N3	0.001	,,	,,	0.1	-ve

Table 4.5 EXAMINATION HELD ON 04 . 08 . 2000

SAMPLE	Fat %	T.S.S %	S.N.F %
D1	2.5	10.8	8.3
D2	3.7	11.2	7.5
D3	3.4	10.4	7
N1	3.0	10.8	7.8
N2	3.2	10.6	7.4
N3	3.1	11	7.9

Table 4.6 Adultration Examination.

Sample	Salt	Sugar	Urea	Bicarbonate	Skim milk powder
D1	-ve	-ve	0.001	0.1	-ve
D2	,,	,,	0.001	0.1	,,
D3	,,	,,	0.001	0.1	,,
N1	,,	,,	0.1	0.1	,,
N2	,,	,,	-ve	0.1	,,
N3	,,	,,	0.1	0.1	,,

Table 4.7 EXAMINATION HELD ON 11.08. 2000

SAMPLE	FAT (%)	T.S.S (%)	S.N.F (%)
D1	3.5	11.8	8.3
D2	3.5	11.0	7.5
D3	3.5	11.0	7.5
N1	3.3	11.0	7.7
N2	3.4	10.8	7.4
N3	3.5	11.0	7.5

Table 4.8 Adultration Examination.

Sample	Salt	Sugar	Urea	Bicarbonate	Skim milk powder
D1	0.01	-ve	0.001	0.1	-ve
D2	0.01	-ve	0.001	0.1	,,
D3	0.01	-ve	0.001	0.1	,,
N1	-ve	,,	-ve	0.01	,,
N2	,,	,,	-ve	0.01	,,
N3	,,	,,	-ve	0.01	,,

Table 4.9 EXAMINATION HELD ON 17.08.2000

SAMPLE	FAT (%)	T.S.S (%)	S.N.F (%)
D1	4.0	10.3	6.8
D2	3.8	9.6	5.8
D3	3.8	10.8	7.0
N1	3.2	10.8	7.6
N2	3.3	10.8	7.5
N3	3.2	11.0	7.8

Table 5.0 Adultration Examination

Sample	Salt	Sugar	Urea	Bicarbonate	Skim milk powder
D1	-ve	-ve	0.01	0.001	-ve
D2	"	"	0.01	0.001	"
D3	"	"	0.01	0.001	"
N1	"	"	-ve	0.1	"
N2	"	"	-ve	0.1	"
N3	"	"	-ve	0.1	"

Table 5.1 EXAMINATION HELD ON 07.09.2000

SAMPLE	FAT (%)	T.S.S (%)	S.N.F (%)
D1	4	12.0	8.0
D2	3.8	12.0	8.2
D3	3.8	12.0	8.2
N1	3.5	10.8	7.3
N2	3.3	10.8	7.5
N3	3.4	10.8	7.4

Table 5.2 Adultration Examination.

Sample	Salt	Sugar	Urea	Bicarbonate	Skim milk powder
D1	-ve	-ve	0.1	0.01	-ve
D2	,,	,,	0.1	0.01	,,
D3	,,	,,	0.1	0.01	,,
N1	,,	0.1	-ve	0.1	,,
N2	,,	0.1	,,	0.1	,,
N3	,,	0.1	,,	0.1	,,

Table 5.3 EXAMINATION HELD ON 21.09.2000

SAMPLE	FAT (%)	T.S.S (%)	S.N.F (%)
D1	3.6	12.0	8.4
D2	3.0	12.0	9.0
D3	3.1	12.0	8.9
N1	3.4	10.4	7.0
N2	3.4	10.4	7.0
N3	3.5	10.4	6.9

Table 5.4 Adultration Examination

Sample	Salt	Sugar	Urea	Bicarbonate	Skim milk powder
D1	0.1	-ve	0.1	0.1	-ve
D2	0.1	,,	0.1	0.1	,,
D3	0.1	,,	0.1	0.1	,,
N1	-ve	,,	0.01	0.01	,,
N2	,,	,,	0.01	0.01	,,
N3	,,	,,	0.01	0.01	,,

Table 5.5 EXAMINATION HELD ON 05.10.2000

SAMPLE	FAT (%)	T.S.S (%)	S.N.F (%)
D1 .	2.9	11.6	8.7
D2	3.0	11.2	8.2
D3	3.0	11.4	8.4
N1	2.5	10.8	8.3
N2	2.7	11.2	7.5
N3	3.4	10.4	7.0

Table 5.6 Adultration Examination.

Sample	Salt	Sugar	urea	Bicarbonate	Skim milk powder
D1	0.1	-ve	0.1	0.01	-ve
D2	0.1	-ve	0.1	0.01	,,
D3	0.1	-ve	0.1	0.01	,,
N1	-ve	0.1	0.1	0.1	,,
N2	-ve	0.1	0.1	0.1	,,
N3	-ve	0.1	0.1	0.1	,,

Discussion

The Quality of milk has been define on the basis of chemical constituent. To determine the quality of milk following examinations were done. The acceptable value for tat and total solids should be in the range of 2.4%-5.5% w/w and 7.9%-10% w/w respectively

During the study which tested for 8 weeks the following observation were made on the samples supplied by two suppliers. Some weeks dairy farm milk suppliers samples were contain low amount of fat and total soluble solids and that samples were positive for the adultration tests.Some weeks nel farm milk suppliers samples were found to be adulterates on the basis of above experimental data

In the first week examination dairy milk suppliers samples answered for the urea test (0.01g) and bicarbonate test (0.01).Nel farm milk suppliers samples answered for the sugar test (0.1g) and bicarbonate test (0.01g).

In the second week examination dairy milk suppliers samples only answered for the urea test(0.01g). Nel farm milk suppliers samples answered for the salt test (0.001g) and bicarbonate test (0.1g).

In the 3rd week examination dairy milk suppliers samples answered for urea test (0.001g) and bicarbonate test (0.1g). Nel farm milk supplier's sample answered for only bicarbonate test.

In the 4th week examination of dairy milk samples answered for the salt test (0.01g) urea test (0.001g) and bicarbonate test (0.1g). Nelfarm samples answered for the only bicarbonate test (0.1g).

In the 5th week examination of dairy milk samples answered for the urea test (0.001g) and bicarbonate test (o.1g) . Nelfarm milk samples answered for only bicarbonate test (0.1g).
In the 6th week examination of dairy milk samples answered for the urea test (0.1g) bicarbonate test (0.01g). Nelfarm milk samples answered for sugar test (0.1g) ,urea test (0.1g), and bicarbonate test (0.1g).
In the 7th week examination of dairy milk samples answered for salt test (0.1g) urea test (0.1g) and bicarbonate test (0.1g).Nelfarm milk samples answered for urea (0.01g) and bicarbonate test (0.1g).

In the 8th week examination of dairy milk samples answered for urea test (0.1g) and bicarbonate test (0.1g). Nelfarm milk samples answered for sugar test (0.1g), urea test (0.1g) and bicarbonate test (0.1g).

According to the above results there is a clear evidance of adultrating the fresh milk by the suppliers, but could not confirmed due to the lack of sophistication and other experimental facilities.

CHAPTER V

Conclusion

5.1 Conclusion

The low amount of fat and solid non- fat value can be seen in some samples. Most of the samples have answered for the adultration. Very minute amount of adultrated substances were detected in the suspected adultrated milk samples.

For the adultration test some samples not answered clearly may be due to the low sensitivity of the chemical analargrade experiments The low amount of fat and solid non fat content may be due to variation of milking intervals breed of milt cows,feeding of cow and seasonal variation

Quality problem may be from improper processing, improper handling and storage.

5.2 Suggestion

The following suggestion can be made to improve the quality of raw milk.

(1) Give a higher attention for milk cows feeding and hygienic.

(2) Fresh milk should be examined properly in milk collection centres and farms for the quality.

(3) Before and after the processing plat form test and adultration test should be done on . each and every batch of samples

(4) In the processing whole the critical points should be considered.

(i) Pasteurisation

Pasteurisation time and temperature should be noted

(ii) Vessels

Milk vessels and processing plant should be cleanclean.

(iii) Workers

Workers must be clean.

(5) From Chemical analysis alone cannot detect the very minute amount of adultrated Substances in milk samples. More sensitive experiments and instrumentation should be employed such as

Eg:- Electron microscopic technique
HPLC method

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