

HAND BOOK OF MILK PROCESSING, DAIRY PRODUCTS AND PACKAGING TECHNOLOGY

TECHNOLOGICAL INNOVATIONS IN INDIAN DAIRY PRODUCTS

India's competitiveness
Potential of Indian dairy products
Current status of Indian dairy products sector
Technological requirements for industrialisation
Recent Innovations in Indigenous milk products industry
Continuous ghee making process
Continuous khoa making plant
Industrial process for gulabjamun
Industrial shrikhand making process
Mechanised production of paneer

MILK AND MILK PRODUCTS

Chemistry of Milk
Water
Fat
Casein
Alpha Lactalbumin
Beta lactoglobulin
Proteose peptone
Bovine serum albumin
Immunoglobulins
Lactoferrin
Lysozyme
Non protein nitrogenous substances
Lactose
Minerals
Enzymes
Vitamins
Milk flavours
Variation in the composition of milk
Physical Properties of Milk
Specific gravity
Density
Refractive Index
Viscosity
Surface tension
Freezing point
Boiling point
Heat stability of milk
Microbiology of Milk
Udder
Milkers
Cow's body
Stable air

Utensils
Detection of bacterial contamination
Methylene blue reductase (MBR) test
Resazurin test
Milk Procurement Systems
Clean milk production
Rural milk collection
Transportation
Grading of milk at collection centres
Milk Reception at Chilling Centre
Grading of milk at chilling centre
Basic Milk Processing
Milk reception at dairy plant
Preservation of raw milk
Adulteration
Detection of adulterants
Detection of neutralizers in milk
Rosalic acid test
Detection of starch
Detection of gelatine
Detection of cane sugar
Detection of saccharin
Detection of glucose of monosaccharides (Barfoed's test)
Detection of sodium chloride
Detection of Urea in milk
Detection of formalin
Detection of hydrogen peroxide
Detection of buffalo milk in cow milk
Detection of skim milk power in milk
Detection of added colour
Detection of pulverized soap
Detection of vegetable fat
Detection of adulteration by using kits
Cleaning and Sanitization of Dairy Equipment
Composition of dairy soils
Detergents
Alkaline detergents
Water softeners
Synthetic detergents
Acid cleaners
Sanitization
Cleaning in place (CIP)
Common Dairy Operations
Clarification
Milk separation
Standardization
Bactofugation
Homogenization
Thermal processing
Pasteurization
Thermization
Ultra pasteurization

Ultra high temperature treatment(UHT)
Sterilization
Microwave heating
Concentration
Drying
Spray drying
Instantization of dried milk
Membrane processing
Ultra filtration (UF)
Reverse osmosis (RO)Nanofiltration (NF)
Micro filtration (MF)
Western Dairy Products
Cream
Manufacturing cream
Thermal processing of cream
Pasteurization
Vacreation
Sterilization
Table cream
Plastic cream
Frozen cream
Clotted cream
Sour cream
Creamery butters
Batch process
Continuous process
Fritz process
Alfa level process
Cherry Burrell's process
Butter oil
Evaporated milk
Sweetened condensed milk
Drying of milk
Infant milk food
Humanized infant formula
Weaving food Malted milk food
Whey power
Butter power
Yoghurt
Cheese
Cheddar cheese
Cottage cheese
Mozzarella cheese
Processed cheese
Frozen dairy products
Sherbets and Ices
Preparation and processing of sherbet/ice mix
Indigenous milk products
Khoa
Burfi
Kalakand
Paneer

Chhana
Dahi
Shrikhand
Ghee
Creamery butter method
Direct cream method
Pre stratification method
Continuous method
Kheer
Payasam
Kulfi
Quality assurance in global context

TECHNIQUES OF PRODUCTS AND PROCESS

Shelf Life Extension and Food Safety
Process Techniques
Water Activity
Hurdle Technology
Processing Conditions
Quality of Non-dairy Ingredients
Packaging Techniques
Reduction of Sugar, Fat and Calories
Replacement of Sugar
High Intensity Sweeteners
Fat Replacers/Mimetics

GLOBAL EXPORT POTENTIAL

US Food and Drug Administration Regulations
Standard of Identify
Food Labelling
Analytical Test
Testing Schedules in India
Certification Scheme for Dairy Products Export
Export Certification System for Dairy Product
System of Approval
Monitoring Visits
Supervisory Visit
Corporate audit
Types of Deficiencies
Health Certification
Complaint Redressal Mechanism
Other Activities for Food Products Export

MILK ITS COMPOSITION AND PROCESSING CHARACTERISTICS

Definition of Milk
Physical Equilibria
Terms Related to Milk Structure
Constituents of Milk
Water

Fat
Fatty Acid profile
Cholesterol
Phosphotipids
Proteins
Caseins
Whey Proteins
Immunoglobulins (Ig)
Lactoterrin
Proteose Peptone
Lactose
Minerals
Minor constituents
Vitamins
Enzymes
Alkaline Phosphates
Lipoprotein Lipase
Protease/Plasmin
Lactoperoxidase (LP)
Lysozyme
Pigments
Physical properties of milk
Appearance
Flavour
Acidity and pH
Oxidation reduction Potential
Thermal Expansion
Density and Specific Gravity
Viscosity
Surface Tension
Curd Tension
Foaming
Boiling Point
Specific heat
Thermal Conductivity
Electrical Conductivity
Refractive Index
Osmotic Pressure
Salt Balance
Heat Stability

DAIRY PRODUCTS INGREDIENTS

Sweeteners Gur (Jaggery)
Khandsari, Bura, Chini
Gur (Jaggery)
Regulatory status
Technology
Khandsari (Khand)
Regulatory status
Technology
Technology

Chini (Refined Sugar)

Technology

Storage

Packaging

Grains

Chawal(Rice), Maida, Suji, Rava

Rice (Chawal)

Quality characteristics

Packaging

Maida and Suji or Rava(Wheat Flours)

Maida (Refined Wheat Flour)

Characteristics

Microscopic appearance

Grades

Packaging

Suji or Rava (Semolina)

Characteristics

Microscopic appearance

Grading

Large particle grade

Small particle grade

Packaging

Storage

Nuts and Seeds Badam, Kaju Copra, Pista, Khaskhas, Akhrot, Kishmish

Almonds (Badam)

Description

Quality Characteristics

Shelf life

Nutritive value

Applications

Almond Oil

Kaju(Cashew)

Quality characteristics

Preservation

Packaging and storage

Copra (Dried Coconut Kernel)

Description

Quality characteristics

Microbiological quality

Grades

Packaging and storage

Pistachio (Pista)

Processing

Regulatory status

Shelf life

Nutritive value

Application

Khaskhas (Poppy Seeds)

Application

Akhrot (Walnuts)

Quality characteristics

In-shell walnuts

Shelled walnuts
Application
Kishmish (Raisins)
Processing
Sulphur fumigation
Drying and post drying processes
Packaging and storage
Flavourings and Colourings
Chhoti Elaichi (Cardamom),
Characteristics
Gradeing
Packaging
Gulab Jal (Rose Essence),
Chemical composition
Limitation rose flavours
Application
Kesar (Saffron)
Packaging
Grading
Flavour
Freedom from moulds insect etc.
Saffron in filament
Saffron in cut filaments
Yellow filaments
Floral waste
Extraneous matter
Saffron powder
Chemical requirements
Cocoa(Cocoa, Cocoa Powder and Coatings)
Cocoa coatings
Characteristics
Packaging and storage
Miscellaneous
Makhana (Gorgon Fruit)
Harvesting and processing
Roasting and popping
Polishing, grading, packaging
Uses
Sabudana (Sago)
Characteristics
Gelatinization
Application
Packaging
Water

MILK BASED PRODUCTS (DESICCATED)

Khoa/Mawa
Product Description
Size of Industry
Technology

Process mechanization
Innovations
Packaging of Khoa
Packaging Study
Recommended packaging
Physico chemical Aspects
Water Activity of Khoa
Rheology of khoa
Microbiological Quality
Preservation of Khoa
Nutritive Value of Khoa
Khoa Powder
Reverse Osmosis(RO)
Spray drying process
Fluidized bed drying
Roller drying process
Gulabjamun
Product Description
Technology
Composition
Rheological properties
Potential process modifications
Shelf Life
Dry Gulabjamun Mix
Skim milk powder based gulabjamun mix
Whole milk powder based gulabjamun
Kalajamun
Technology
Pantua
Product Description
Technology
Physico chemical Aspects
Lalmohan
Technology
Burfi
Technology
Industrial Manufacture
Quality Factors
Fat content
Stage of sugar addition
Effect of additives
Corn syrup addition
Desiccation temperature
Physico chemical characteristics
Flavour
Colour
Body
Texture
Equilibrium relative humidity (ERH) of burfi
Free fatty acids
Hydroxy methyl furfural (HMF) content
Microbiological Quality

Shelf life
Rancidity
Acid development
Browning
Packaging
Kalakand
Product Description
Size of Industry
Technology
Sensory Quality
Fat
Sugar
Strength and type of coagulant
Microbiological quality
Sensory quality
Packaging and Storage
Milk Cake
Technology
Peda
Product Description
Technology
Current Status
Quality Factors
Packaging
Shelf life
Dharwad Peda
Size of industry
technology
Thirattupal
Technology
Prospects of Mechanization
Rabri
Product Description
Technology
Physico chemical Aspects
Current Status
Khurchan
Product Description
Technology
Basundi
Product Description
Size of Industry
Technology
Physico chemical Aspects
Innovation
Kulfi and Frozen Desserts
Product Description
Technology
Innovations
Formulation of Kulfi
Optional dairy ingredients for kulfi and frozen desserts
Sweet fresh cream and fresh milk

Frozen cream
Fluid whole and skim milk
Plain condensed skim milk
Plain condensed whole milk
Superheated condensed skim or whole milk
Sweetened condensed whole or skim milk
Packaging
Physico chemical Aspects
Shelf life
Malai Ka Baraf
Falooda
Product Description
Technology
Innovations
Regional Products
Kunda
Product Description
Technology
Physico chemical Aspects
Shelf life
Bal Mithai
Product Description
Technology

HEAT ACID COAGULATED PRODUCTS

Paneer
Product Description
Size of Industry
Technology
Industrial Process
Section of milk
Heat treatment
Coagulation
Whey Drainage
Hooping
Pressing
Cooling
Yield
Packaging
Shelf life
Defects in Paneer
Technology Assessment
Innovations
Physico chemical Changes During Paneer Manufacture
Microstructure of Paneer
Products Analogous to Paneer
Manufacture methods
Soya Paneer(Tofu)
Soya Paneer (Tofu)
Chhana
Product Description

Technology
Innovations
Coagulants
Temperature and pH of coagulation
Microbiological quality
Packaging
Shelf life
Rasogolla
Product Description
Size of Industry
Technology
Sujgar syrup
Mechanized production
Use of milk powder
Dried rasogolla mix
Yield
Packaging
Rasomalai
Product Description
Technology
Rajbhog
Technology
Khirmohan
Sandesh
Product Description
Technology
Physico chemical Aspects
Chhana Murki
Product Description
Technology
Prospects for mechanization
Cham-Cham
Technology
Prospects for mechanization
Chhana Podo
Surti paneer
Technology
Pandel cheese
Product Description
Technology
Regional Products
Ksheer Sagar
Sita Bhog
Chhana Gaja
Chhana Jhele
Chhana Kheer
Chhana Pakora
Rasaballi
Shosim
Kalari

FAT-RICH PRODUCTS

Ghee

Product Description

Size of Industry

Technology

Pre stratification method

Mechanized Manufacture

Packaging

Physico chemical Aspects

Cow vs Buffalo Milk Ghee

Compound Lipids

Phospholipids

Derived lipids

Cholesterol

Fat soluble Pigments

Ghee Flavour

Carbonyls

Lactones

Dairy starter microorganisms

Flavour simulation

Grain formation

Renovation of rancid ghee

Defects in Ghee

Oxidative rancidity

Fishy taints

Analytical properties and quality control

Functionality

Mouthfeel

Flakiness and tenderness

Shelf life

Baked Products

Ghee Residue

Product Description

Technology

Fat Recovery

Physico chemical characteristics

Antioxidant Properties

Effect of lipids constituents

Effect of non-lipid constituents

Flavour potential

Nutritive Value

Ghee residue Chocolate/Burfi Confection

Method of Preparation

Makkhan

Size of Industry

Product Description

Technology

Physico chemical Aspects

Functionality

Malai

Product Description

Technology
Physico chemical Aspects

CULTURED/FERMENTED PRODUCTS

Dahi and Yogurt
Different flavours
Product Description
Starter Cultures
Selection
Antibiotics
Sweeteners
Bacteriophages
Production of Starters
Technology
Equipment
Storage Tank
Heat Treatment
Homogenization
Fermentation
Packaging and Storage
Quality Control
Mishti Doi
Product Description
Technology
Industrial Production
Starter Culture
Process
Incubation
Storage
Transportation and Distribution
Novelties
Shrikhand
Product Description
Technology
Traditional method
Innovations
Preparation of curd
Preparation of chakka
Preparation of shrikhand from chakka
Starter cultures
Separation of whey from curd
Mixing of chakka with cream and sugar
Packaging of shrikhand
Shelf life
Physico chemical Aspects
Chakka powder
Shrikhand Wadi
Approximate Composition
Lassi
Technology
Innovations

Physico chemical Aspects
Mattha/Chhach/Chhas
Product Description
Technology
Physico chemical Aspects
Kadhi
Product Description
Technology
Kadhi Powder
Reconstitution
Packaging
Pouched Kadhi
Raita
Product Description
Technology
Dahi Vada
Product Description

MILK BASED PUDDINGS/DESSERTS

Kheer
Product Description
Size of Industry
Technology
Process Upgradation
Selection of Rice
Cooking Characteristics of Rice
Long life Kheer
Physico chemical characteristics
Shelf Life
Dried Kheer Mix
Manufacturing Method
Physico chemical Characteristics
Shelf Life
Payasam
Product Description
Classification
Pulse based Payasams
Cereal based payasams
Vermicelli payasams
Rice suji based payasam
Wheat suji based payasam
Avalakki (beaten rice based) payasam
Ada based payasam
Tuber crop based payasams
Fruit based payasams
Seed based payasams
Physico chemical Characteristics
Phimi
Ingredients
Technology
Sevian

Product Description
Technology
Sabudana Kheer
Technology
Lauki Kheer
Product Description
Technology
Sohan Halwa
Product Description
Technology
Gajar Ka Halwa
Product Description
Technology
Innovations
Quality Factors
Packaging
Kaju Burfi
Product Description
Technology
Regional Products
Ghevar
Product Description
Technology
Lauki Halwa
Padusha (Makkhan Bada)
Jilli
Technology
Mohandas

PLAN FOR PRODUCT MAUFACTURING

Liquid Milk Handling Section
Shrikhand
Packaging of Shrikhand
Dahi and mishti doi
Packaging
Lassi
Packaging
Khoa and Peda
Manufacturing Process of Khoa
Manufacturing Process of Peda
Peda Shaping Machine
Partial Drying of Peda
Packaging Machine
Gulabjamun
Packaging
Paneer
Packaging
Ghee
Packaging
Rasogolla, Kheer and Pal Payasam

DETAILS OF PLANT AND EQUIPMENTS

Milk Storage Tank (Vertical) with pump
Pasteurizer with Pump
Triprocess Centrifuge
Dahi Tanks with Pump
Maska Separator or Quarg Centrifuge
Scraped Surface heat Exchanger(SSHE) with one positive pump)
Shrikhand Cooling and Storage Tank (Vertical, with positive rotary pump)
Cream Concentrator
Homogenizer
Multi purpose Vat with pump
UHT Milk Sterilization Plant
Aseptic form fill and seal (FFS) Machine
Inclined Scraped Surface heat Exchanger (ISSHE)
Steam Jacketed Pan
Constructional Features
Planetary Mixer
Peda Shaping Machine
Portioning Machine
Ball Rolling Machine for Gulabjamun
Gulabjamun Ball Frying Tank
Sugar Syrup Tank
Paneer Vat (Cheese vat)
Paneer Press
Clarifier
Pressure Filter

PACKAGING

Packaging Materials
Properties of Packaging Material
Tin Containers
Aluminium Foils/Containers
Paper Carton Boards
Glass
Corrugated Board
Plastic materials
Low density and linear low density polyethylene (LDPE/LLDPE)
High density polyethylene (HDPE)
Polyethylene terephthalate (PET)
Polystyrene
Polypropylene
Polyvinyl chloride (PVC)
Multi layer sheet/film
Biaxially oriented polypropylene (BOPP)
Packaging Techniques
Vacuum packaging
Modified Atmosphere Packaging (MAP)
Oxygen Absorbers/Scavengers
Poly Clip System

Aseptic Packaging
Computer aided Designing
Edible Packaging
Disposal of Packages
Dump filling
Incineration
Reuse
Recycling of Packaging Materials
Tin plate
Aluminium
Plastic
Paper
Recommended Packaging & Storage Conditions
Packaging Machines
Tin Can Filling Machine
Seaming Machine
Empty tin sterilizer
Form fill and seal (FFS) Machine
Ghee Pouch FFS Machine
Pasteurized Dahi/Lassi FFS Machine
Cup Thermo fill and Sealing Machine
Pre formed cup filling and sealing Machine
In line cup filling, sealing and crating Machine
Multi fill packaging machine
Vacuum and Gas Packaging Machine
Nozzle vacuumizing
Chamber vacuumizing
Cartoning Machine
Shrink Wrapping Machine
Procurement of Packaging Machine

PROCESSING OF MILK AND MILK PRODUCTS

Membrane Technology
Reverse osmosis and ultrafiltration
Materials and Module Configurations
Merits and Demerits of Membrane Technology
Applications
Reverse Osmosis (RO)
Ultrafiltration (UF)
Possible Applications in India
Ultra High Temperature Treatment of Milk
Changes in Constituents of Milk
Fat
Protein
Calcium
Sensory aspects
Nutrition aspects
Equipment
Aseptic packaging
Applications in India
Proteinases

Lipases
Lactase
Beta galactosidase

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