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NATIONAL DAIRY RESEARCH AND DEVELOPMENT CENTRE
DEPARTMENT OF LIVESTOCK
MINISTRY OF AGRICULTURE & FORESTS
YUSIPANG, THIMPHU

# STANDARD OPERATING PROCEDURES FOR DAIRY PRODUCTS

NDRDC (2021): 17

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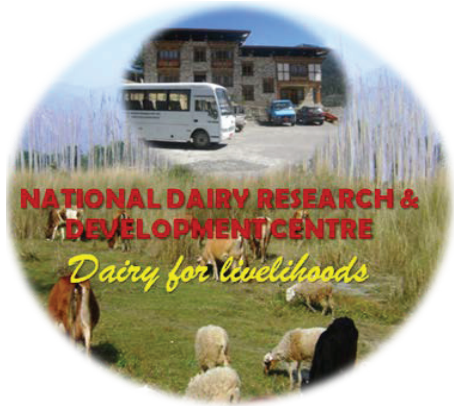


Contact Address:
Specialist Head/Program Director
National Dairy Research & Development Centre,
Yusipang, Department of Livestock, MoAF

PO Box: 1058
Office Phone: +97517116985, 17116985 (PABX) Lab: 17116986
Email:ndrc17@gmail.com

# Contents

## Contributors

1. Phuntsho Tobgyel Norbu, Principal Livestock Officer, NDRDC, Yusipang
2. Kinley Choki, Deputy Chief Livestock Officer, NDRDC, Yusipang
3. Sonam Zangmo, Dairy Officer, NDRDC, Yusipang

## STANDARD OPERATING PROCEDURE FOR RECEIVING RAW MILK

### Purpose

Shall apply for the proper receiving and documentation of raw milk in the Milk Collection Centres (MCCs) and Milk Processing Units (MPUs)

### Scope

The SOP shall apply to individuals involved in the collection and receipt of raw milk in the MCCs and MPUs

### Safety and Environmental Consideration

Raw milk in cans or other containers entering the MCCs and MPUs are a potential source of contaminants and is an important **critical control point** to ensure contaminants do not enter the collection or processing environment with the product. Proper documentation for receipt of raw milk is essential for traceability of contaminated products and implementation of corrective action. Disposal of milk and by-products from collection or processing should follow norms as prescribed by the National Environment Commission.

### 1. Responsibility

1.1. The individual receiving milk shall be trained in proper sampling of milk and platform milk tests to ensure quality of milk being received

1.2. The individual shall ensure that all milk received is transported in stainless steel or aluminium milk containers. Plastic containers should not be accepted as risk of contamination is increased

1.3. The individual receiving the milk shall maintain appropriate documentation and take suitable samples for testing of milk prior to accepting the milk. All tests as specified in Platform Milk Tests should be carried out to ensure supply of good quality milk

1.4. All records pertaining to the sample of milk tested shall be maintained and records shall be presented to group members and sent to the respective Dzongkhag Livestock Offices as and when required

1.5. The Group Secretary and Treasurer shall maintain all records and make timely payments to the group members for supply of milk

## 2. Materials and Equipment

2.1. Milk Cans
2.2. Stainless Steel milk can stirrer
2.3. Stainless Steel milk funnel and filter
2.4. Milk can hammer
2.5. Milk measuring set
2.6. Digital weighing scale
2.7. Milk thermometer (preferably stainless steel milk thermometer)
2.8. Recording documents
2.9. Platform milk test equipment
    2.9.1. Clot on Boil Test (Test Tubes, Spirit Lamp, Test Tube holder and Stand)
    2.9.2. Alcohol Test (Test tubes, 90% ethanol, Test Tube Holder and Stand)
    2.9.3. Lactometer Test (Lactometer with lactometer jar)

## 3. Procedure

3.1. Milk cans entering the MCC/MPU should be clean and have lids properly fastened
3.2. Visual examination/Organoleptic tests (colour, smell and taste) should be conducted. Milk presenting abnormalities (off colour, off smell or off taste) should be rejected
3.3. Temperature of all milk being received should be recorded with the milk thermometer and should preferably be received at a temperature of not more than 10ºC. If temperature of milk is above 10ºC, members should be informed that milk should be cooled prior to supply to prevent rapid growth of microorganisms in the milk
3.4. All milk samples should be subject to testing using the Platform Milk Test procedures and milk failing any of the platform milk tests should be rejected:
    3.4.1. Clot on boil test
    3.4.2. Alcohol Test (if available)
    3.4.3. Lactometer test

3.5. Periodic samples of the milk should be sent to the respective Dzongkhag Veterinary Hospitals/Accredited Food Testing Laboratory for antibiotic testing

3.6. Milk is transferred to processing equipment for manufacture of desired products

3.7. All milk cans, testing equipment and any other equipment used during the handling of milk should be washed using appropriate detergents (do not use laundry detergents), rinsed and sanitized (dairy sanitizers or hot water sterilization)

3.8. All records on the milk received such as date, amount, source, results of the platform milk test and antibiotic test (as and when conducted) should be recorded

3.9. Records for processing of milk products should be maintained with information on the quantity of milk processed and quantity of products manufactured

3.10. All records maintained should be signed by person maintaining the record for accountability

## 4. Reference Documents

4.1. For performing platform milk tests, refer to poster on Platform Milk Test, National Dairy Research Centre, Yusipang

# STANDARD OPERATING PROCEDURE FOR MANUFACTURE OF MOZZARELLA

## Purpose

To ensure production of Mozzarella following proper Good Manufacturing Practices and to prevent food quality/safety issues.

## Scope

Shall apply to Milk Processing Units (MPUs)/Dairy Processing Plants (DPPs) during production of the specified product.

## Safety and Environmental Consideration

Follow instructions for use and always be careful when working with hot water and chemical cleaners.

The disposal of by products, milk residues and waste should follow norms as prescribed by the National Environment Commission.

## 1. Responsibility

1.1 Staff should be trained in milk sampling, platform milk tests and to maintain proper documentation to ensure milk quality during milk reception.

1.2 Staff should be trained in operation of equipment and should maintain proper documentation during production as per production log sheet.

1.3 Plant manager/Supervisors/Group Chairman should ensure proper record maintenance of all activities to be presented to group members, regulatory body (BAFRA) and respective Dzongkhag Livestock Offices as and when required.

## 2. Raw Materials

2.1 Raw Milk

2.2 Skim Milk/Cream

2.3 Thermophilic Culture/Mesophilic culture

2.4 Rennet

2.5 Salt

2.6 Acid (Acetic Acid/Citric Acid)

## 3. Equipment

3.1 Milk Analyser

3.2 Alkaline Phosphate Test Kit

3.3 pH Meter

3.4 Acidity Testing Kit

3.5 Cream Separator

3.6 Homogenizer

3.7 High Temperature Short Time (HTST) Pasteurizer

3.8 Steam Generator/Steam Boiler

3.9 Cold Store

3.9.1 Deep Freezer

3.9.2 Cheese Moulding and Stretching Machine

3.9.3 Cheese Drain Table

3.9.4 Brine Tank

3.9.5 Milk Storage Tank

## 4. Procedures

### 4.1 Milk Reception and Testing

4.1.1 Refer to SOP for Receiving Raw Milk

### 4.2 Standardization

4.2.1 Standardize to 3 - 4% fat or Casein/Fat ratio 0.7.
Standardization is carried out with addition of calculated amount of skim milk or removal of cream.

4.2.2 Pre heat milk to 40 - 45°C for separation of cream and/or skim milk.

4.2.3 Homogenize at 2000 to 2500 psi at 60-70°C.

## 4.3 Processing

### 4.3.1 Culture Method

4.3.1.1 Pasteurize standardized milk at 72 - 75°C/15 seconds (HTST) and cool down to 45°C.

4.3.1.2 Draw a representative sample of pasteurized milk and perform alkaline phosphate test to check for proper pasteurization of milk. (Positive test indicates that milk has not been pasteurized).

4.3.1.3 Add starter culture @ 2% of milk volume at 42 - 45°C and mix thoroughly. Hold for 45 minutes to 1 hour.

4.3.1.4 Add Rennet @ 1g/100kg milk and hold for 15 - 20 minutes or until a firm curd is formed.

4.3.1.5 Cut cheese curd and hold for 5 minutes for whey separation.

4.3.1.6 Cook curd in whey at 40 - 45°C for 30 - 40 minutes.

4.3.1.7 Drain whey.

4.3.1.8 Cheddaring of cheese curd (acid development till 0.75 Lactic Acid in whey or 1 - 2 hours).

4.3.1.9 Stretch cheese curd at 80 - 85°C/3 - 5 minutes and mould/shape (manually or machine).

4.3.1.10 Keep cheese in cold brine solution (20 - 23% brine solution) for 4 hours.

4.3.1.11 Surface drying in cold storage for 5 - 6 hours.

4.3.1.12 Pack in appropriate material with batch and manufacturing date.

4.3.1.13 Store under refrigeration temperature.

4.3.1.14 Deliver cheese to retail outlets under refrigerated conditions.

4.3.1.15 Send periodic representative batch samples of cheese to accredited food testing laboratory for testing.

### 4.3.2 Acid Method

4.3.2.1 Pasteurize standardized milk at 72 - 75°C/15 seconds (HTST) and cool to <15°C.

4.3.2.2 Draw a representative sample of pasteurized milk and perform alkaline phosphate test to check for proper pasteurization of milk. (Positive test indicates that milk has not been pasteurized).

4.3.2.3 Transfer the pasteurized milk to cheese vat.

4.3.2.4 Acidification with Acetic acid/citric acid (pH 5.5 - 5.6).

4.3.2.5 Heat to 35°C.

4.3.2.6 Add Rennet @ 0.75g/100kg milk and hold for 15 - 20 minutes until firm curd is formed.

4.3.2.7 Cut cheese curd and hold for 3 - 5 minutes for whey separation.

4.3.2.8 Cook curd in whey at 35 - 40°C/30 - 40 minutes.

4.3.2.9 Drain whey.

4.3.2.10 Cheddaring of cheese curd at 35 - 40°C/1-2 hours or acid development 0.75 % LA (Lactic Acid) of whey

4.3.2.11 Stretch cheese curd at 80 - 85°C/3 - 5 minutes and mould/ shape (manually or machine).

4.3.2.12 Keep cheese in cold brine solution (20 - 23% brine solution) for 4 hours.

4.3.2.13 Surface drying in cold storage 5 - 6 hours.

4.3.2.14 Pack in appropriate material with batch and manufacturing date.

4.3.2.15 Store under refrigeration temperature.

4.3.2.16 Deliver cheese to retail outlets under refrigerated conditions.

4.3.2.17 Send periodic representative batch samples of cheese to accredited food testing laboratory for testing.

## 5. Documentation

5.1 Milk reception record

5.2 Platform test and other tests record

5.3 Milk standardization record

5.4 Pasteurization record

5.5 Lot/Batch Numbers of raw material used during processing

5.6 Mozzarella production sheet

5.7 Cold store temperature recording sheet

5.8 Daily and weekly cleaning log sheet

## 6. Reference

6.1 For performing platform milk tests, refer to poster on Platform Milk Test, National Dairy Research Centre, Yusipang

6.2 For operation of cream separator, refer to poster on Operation Manual for Cream Separator, National Dairy Research Centre, Yusipang

## STANDARD OPERATING PROCEDURE FOR MANUFACTURE OF GOUDA CHEESE

### Purpose

To ensure production of Gouda Cheese following proper Good Manufacturing Practices and to prevent food quality/safety issues.

### Scope

Shall apply to Milk Processing Units (MPUs)/Dairy Processing Plants (DPPs) during production of the specified product.

### Safety and Environmental Consideration

Follow instructions for use and always be careful when working with hot water and chemical cleaners.

The disposal of by products, milk residues and waste should follow norms as prescribed by the National Environment Commission.

### 1. Responsibility

1.1 Staff should be trained in milk sampling, platform milk tests and to maintain proper documentation to ensure milk quality during milk reception.

1.2 Staff should be trained in operation of equipment and should maintain proper documentation during production as per production log sheet.

1.3 Plant manager/Supervisors/Group Chairman should ensure proper record maintenance of all activities to be presented to group members, regulatory body (BAFRA) and respective Dzongkhag Livestock Offices as and when required.

### 2. Raw Materials

2.1 Raw Milk

2.2 Skim Milk/Cream

2.3 Gouda Cheese Culture

2.4 Rennet

2.5 Salt

2.6 Calcium Chloride

## 3. Equipment

3.1 Milk Analyzer

3.2 Alkaline Phosphate Test Kit

3.3 pH Meter

3.4 Cream Separator

3.5 Homogenizer

3.6 Steam Generator/Steam Boiler

3.7 Cheese Vat

3.8 Cold Store/Display refrigerator

3.9 Deep Freezer

3.9.1 Cheese Mould and Press

3.9.2 Cheese Drain Table

3.9.3 Cheese Cellar/Ageing room

## 4. Procedures

### 4.1 Milk Reception and Testing

4.1.1 Refer to SOP for Receiving Raw Milk

### 4.2 Standardization

4.2.1 Standardize to 3 - 4% Fat

4.2.2 Standardization is carried out with addition of a calculated amount of skim milk or removal of cream.

4.2.3 Pre heat the milk to 40 - 45°C for separation of cream and/or skim milk.

4.2.4 Homogenize at 2000 to 2500 psi at 60 - 70°C.

### 4.3 Processing

4.3.1 Pasteurize standardized milk at 72 - 75°C/15 seconds (HTST) and cool down to 40°C.

4.3.2 Draw a representative sample of pasteurized milk and perform alkaline phosphate test to check for proper pasteurization of milk. (Positive test indicates that milk has not been pasteurized).

4.3.3 Add calcium chloride (25g/100 Litres)

4.3.4 Add starter culture (0.7 - 1% of milk) at 36 - 38°C, mix thoroughly and incubate for 30 - 40 minutes.

4.3.5 Add Rennet (0.022% of milk) at 30°C and incubate for 20 - 30 minutes or until formation of a firm curd.

4.3.6 Cut the curd into 1x1x1 cm and stir gently (15 minutes)

4.3.7 Remove 1/3rd whey and replace with same quantity of hot water (60°C) to bring the temperature of whey to Not More Than (NMT) 38°C.

4.3.8 Stir for 30 minutes and allow to settle for 5 minutes in whey.

4.3.9 Remove whey till the level of the curd and replace with hot water (60°C) to slowly bring the temperature of whey to NMT 38°C.

4.3.10 Stir for 15 minutes and allow to settle for 5 minutes in whey.

4.3.11 Drain out all the whey.

4.3.12 Hoop cheese curd into mould lined with cloth, light pressing (5-6 kg) for 5-10 minutes and turn the cheese, apply 5-6 kg for 30 minutes.

4.3.13 More weight pressing (10-12 kg) and turn cheese after every 1 hour (repeat turning and pressing 3-4 times) and press overnight.

4.3.14 Remove the cheese from the mould and weight the cheese.

4.3.15 Immerse cheese in brine solution of 20% and adjust the brine solution pH to 5.2. (Brining time depends on cheese weight viz., 0.5 kg/20 h, 1 kg/36 h, 10 kg/60 h).

4.3.16 Surface drying of cheese for 5 to 6 days at 12 - 16°C.

4.3.17 Ripen/aging in the cheese cellar maintained at 12 - 16°C and Relative Humidity (RH) of 80 - 85% up to 3 - 4 weeks.

4.3.18 The cheese cellar shelves should be cleaned regularly to prevent mold growth.

4.3.19 Package in appropriate materials with batch number and manufacturing date.

4.3.20 Store under refrigerated condition.

4.3.21 Deliver cheese to retail outlets under refrigerated conditions.

4.3.22 Send periodic representative batch samples of cheese to accredited food testing laboratory for testing.

## 5. Documentation

5.0.23 Milk reception record
5.0.24 Platform test and other tests record
5.0.25 Milk standardization record
5.0.26 Pasteurization record
5.0.27 Gouda production sheet
5.0.28 Lot/Batch Numbers of raw material used during processing.
5.0.29 Cheese cellar temperature and RH recording sheet.
5.0.30 Cold store temperature recording sheet
5.0.31 Daily and weekly Cleaning log sheet

## 6. Reference

6.0.32 For performing platform milk tests, refer to poster on Platform Milk Test, National Dairy Research Centre, Yusipang
6.0.33 For operation of cream separator, refer to poster on Operation Manual for Cream Separator, National Dairy Research Centre, Yusipang

## STANDARD OPERATING PROCEDURE FOR MANUFACTURE OF PLAIN/FLAVOURED SET YOGURT

### Purpose

To ensure production of Set Yogurt following proper Good Manufacturing Practices and to prevent food quality/safety issues.

### Scope

Shall apply to Milk Processing Units (MPUs)/Dairy Processing Plants (DPPs) during production of the specified product.

### Safety and Environmental Consideration

Follow instructions for use and always be careful when working with hot water and chemical cleaners.
The disposal of by products, milk restudies and waste should follow norms as prescribed by the National Environment Commission.

### 1. Responsibility

1.1 Staff should be trained in milk sampling, platform milk tests and to maintain proper documentation to ensure milk quality during milk reception.
1.2 Staff should be trained in operation of equipment and should maintain proper documentation during production as per production log sheet.
1.3 Plant manager/Supervisors/Group Chairman should ensure proper record maintenance of all activities to be presented to group members, regulatory body (BAFRA) and respective Dzongkhag Livestock Offices as and when required.

### 2. Raw Materials

2.1 Raw milk
2.2 Skim milk Powder/Whole Milk Powder
2.3 Yogurt Culture

## 3. Equipment

3.1 Milk Analyzer
3.2 Alkaline Phosphate Test Kit
3.3 Cream Separator
3.4 Homogenizer
3.5 Yogurt Vat
3.6 Steam Generator/Steam Boiler
3.7 Incubation Chamber
3.8 Yogurt Trays
3.9 Yogurt Tray Trolleys
3.10 Cold Store/Display Refrigerator
3.11 Deep Freezer
3.12 Cup Filling and Sealing Machine
3.13 Yogurt Cups with Lids or with Sealing Film Rolls

## 4. Procedures

### 4.1 Milk reception and testing

4.1.1 Refer to SOP for Receiving Raw Milk

### 4.2 Standardization

4.2.1 Standardize to required fat and SNF content.
Standardization is carried out with addition of calculated amount of skim milk/milk solids or removal of cream.

4.2.2 Pre heat the milk to 40 - 45°C for separation of cream and/or skim milk.

4.2.3 Add calculated amount of milk solids into the yogurt vat at 50 - 60°C and mix thoroughly. (Ensure Fat and SNF content is as per product label, if desirable Fat and SNF is not reached then re-standardize the milk).

4.2.4 Homogenize at 2000 to 2500 psi at 60 - 70°C.

## 4.3 Processing (Plain Set Yogurt)

4.3.1 Continue heating standardized milk till recommended pasteurization time temperature combination is achieved (80°C for 30 min, or 85°C for 20 min or 90°C for 10 min or 95°C for 5 min).

4.3.2 Draw a representative sample of pasteurized milk and perform alkaline phosphate test to check for proper pasteurization of milk. (Positive test indicates that milk has not been pasteurized).

4.3.3 Cool Milk to 45°C.

4.3.4 Add starter culture @ 2% of milk at 42 - 45°C and mix thoroughly.

4.3.5 Fill and seal in desired yogurt cups (manually or using filling and sealing machine) with batch number and manufacture date.

4.3.6 Place the filled cups in yogurt trays and transfer into the incubation chamber maintained at 45°C for 2 - 3 hours or until pH 4.5 is reached.

4.3.7 Transfer yogurt to cold store and keep stored until dispatched (Before dispatch check the yogurt cups for any leakages and segregate the cups with leaks).

4.3.8 Deliver yogurt to retail outlets under refrigerated conditions.

4.3.9 Carry out shelf life test with at least two samples from each batch.

4.3.10 Send periodic batch samples of yogurt to accredited food testing laboratory for testing.

## 4.4 Processing (Flavoured set type)

4.4.1 Continue heating standardized milk till recommended pasteurization time temperature combination is achieved (90°C/no hold, 85°C/10 min and 80°C/15 min).

4.4.2 Draw a representative sample of pasteurized milk and perform alkaline phosphate test to check for proper pasteurization of milk. (Positive test indicates that milk has not been pasteurized).

4.4.3 Cool milk to 45°C.

4.4.4 Add starter culture @ 2% of milk at 42 - 45°C, mix thoroughly at 45°C and add colour and flavour.

4.4.5 Fill and seal in desired yogurt cups (manually or using filling and sealing machine) with batch number and manufacture date.

4.4.6 Place the filled cups in yogurt trays and transfer into incubation chamber maintained at 45°C for 2 - 3 hours or until pH 4.5 is reached.

4.4.7 Transfer yogurt to cold store and keep stored until dispatched (Before dispatch check the yogurt cups for any leakages and segregate the cups with leaks).

4.4.8 Deliver yogurt to the retail outlets under refrigerated conditions.

4.4.9 Carry out shelf life test with at least two samples from each batch.

4.4.10 Send periodic batch samples of yogurt to accredited food testing laboratory for testing.

## 5. Documentation

5.1 Milk reception record

5.2 Platform test and other tests record

5.3 Milk standardization record

5.4 Pasteurization record

5.5 Yogurt production sheet

5.6 Lot/Batch Numbers of raw material used during processing,

5.7 Incubator and cold store Temperature recording sheet

5.8 Shelf life quality record

5.9 Daily and weekly Cleaning log sheet

## 6. Reference

6.1 For performing platform milk tests, refer to poster on Platform Milk Test, National Dairy Research Centre, Yusipang

6.2 For operation of cream separator, refer to poster on Operation Manual for Cream Separator, National Dairy Research Centre, Yusipang

## STANDARD OPERATING PROCEDURE FOR MANUFACTURE OF STIRRED YOGURT

### Purpose

To ensure production of Stirred Yogurt following proper Good Manufacturing Practices and to prevent food quality/safety issues.

### Scope

Shall apply to Milk Processing Units (MPUs)/Dairy Processing Plants (DPPs) during production of the specified product.

### Safety and Environmental Consideration

Follow instructions for use and always be careful when working with hot water and chemical cleaners.

The disposal of by products, milk restudies and waste should follow norms as prescribed by the National Environment Commission.

### 1. Responsibility

1.1 Staff should be trained in milk sampling, platform milk tests and to maintain proper documentation to ensure milk quality during milk reception.

1.2 Staff should be trained in operation of equipment and should maintain proper documentation during production as per production log sheet.

1.3 Plant manager/Supervisors/Group Chairman should ensure proper record maintenance of all activities to be presented to group members, regulatory body (BAFRA) and respective Dzongkhag Livestock Offices as and when required.

### 2. Raw Materials

2.1 Raw milk

2.2 Skim milk Powder/Whole Milk Powder

2.3 Yogurt Culture

2.4 Sugar

2.5 Food Flavouring Agent

2.6 Food Colouring Agent

## 3. Equipment

3.1 Milk Analyzer

3.2 Alkaline Phosphate Test Kit

3.3 Cream Separator

3.4 Homogenizer

3.5 Yogurt Vat

3.6 Steam Generator/Steam Boiler

3.7 Incubator

3.8 Yogurt Trays

3.9 Yogurt Tray Trolleys

3.10 Cold Store/Display Refrigerator

3.11 Deep Freezer

3.12 Cup Filling and Sealing Machine

3.13 Yogurt Cups with Lids or Cup Sealing Film Rolls

## 4. Procedures

### 4.1 Milk reception and testing

4.1.1 Refer to SOP for Receiving Raw Milk.

### 4.2 Standardization

4.2.1 Standardize to required fat and SNF content.

Standardization is carried out with addition of calculated amount of skim milk/milk solids or removal of cream.

4.2.2 Pre heat the milk to 40 - 45$^{o}$C for separation of cream and/or skim milk.

4.2.3 Add required amount of milk solids and 1 - 5% sugar into the yogurt vat at 50-60$^{o}$C and mix thoroughly. (Ensure Fat and SNF content is as per product label, if desirable Fat and SNF is not reached then re-standardize the milk)

4.2.4 Homogenize at 2000 to 2500 psi at 60-70°C.

### 4.3 Processing (Flavoured stirred type)

4.3.1 Continue heating standardized milk till recommended pasteurization time temperature combination is achieved (90°C/no hold, 85°C/10 min and 80°C/15 min).

4.3.2 Draw a representative sample of pasteurized milk and perform alkaline phosphate test (If test is positive re-pasteurize the whole batch).

4.3.3 Cool milk to 45°C.

4.3.4 Add starter culture @ 2% of milk at 42 - 45° and mix thoroughly. Incubate in the yogurt vat for 2-3 hours at 45°C or until pH 4.5 is reached.

4.3.5 Cool down to 20 - 25°C and stir and add colour and flavour.

4.3.6 Fill and seal in desired yogurt cups (manually or using filling and sealing machine) with batch number and manufacture date.

4.3.7 Transfer cups for cooling and storage in cold store until dispatch. **(**Before dispatch check cups for any leakages and segregate the cups with leaks).

4.3.8 Deliver yogurt to the retail outlets under refrigerated conditions.

4.3.9 Carry out shelf life test with at least two samples from each batch.

4.3.10 Send periodic batch samples of yogurt to accredited food testing laboratory for testing.

## 5. Documentation

5.1 Milk reception record

5.2 Platform test and other tests record

5.3 Milk standardization record

5.4 Yogurt production sheet

5.5 Pasteurization record

5.6 Lot/Batch Numbers of raw material used during processing,

5.7 Incubator and cold store Temperature recording sheet

5.8 Keeping quality record

5.9 Daily and weekly Cleaning log sheet

## 6. Reference

6.1 For performing platform milk tests, refer to poster on Platform Milk Test, National Dairy Research Centre, Yusipang

6.2 For operation of cream separator, refer to poster on Operation Manual for Cream Separator, National Dairy Research Centre, Yusipang

## STANDARD OPERATING PROCEDURE FOR MANUFACTURE OF CLARIFIED BUTTER/GHEE

### Purpose

To ensure production of Clarified Butter/Ghee following proper Good Manufacturing Practices and to prevent food quality/safety issues.

### Scope

Shall apply to Milk Processing Units (MPUs)/Dairy Processing Plants (DPPs) during production of the specified product.

### Safety and Environmental Consideration

Follow instructions for use and always be careful when working with hot water and chemical cleaners.

The disposal of by products, milk restudies and waste should follow norms as prescribed by the National Environment Commission.

### 1. Responsibility

1.1 Staff should be trained in milk sampling, platform milk tests and to maintain proper documentation to ensure milk quality during milk reception.

1.2 Staff should be trained in operation of equipment and should maintain proper documentation during production as per production log sheet.

1.3 Plant manager/Supervisors/Group Chairman should ensure proper record maintenance of all activities to be presented to group members, regulatory body (BAFRA) and respective Dzongkhag Livestock Offices as and when required.

### 2. Raw Materials

2.1 Butter

## 3. Equipment

3.1 Automatic/Semi automatic Clarified butter Machine
3.2 Deep freezer
3.3 Lacquered Tin Can with Lids/ Glass Bottles/ HDPE Container with Lids
3.4 Filling and Sealing Machine
3.5 Sieve/Mesh
3.6 Storage Tank

## 4. Procedures

4.1 Transfer butter into the butter melting vat.
4.2 Heat the melted butter to 110-120$^{o}$C until golden yellow in colour.
4.3 Filter through mesh (size 60) into storage tank.
4.4 Cool to 90$^{o}$C.
4.5 Pack at 45$^{o}$C with batch number and manufacture date.
4.6 Storage until dispatched.
4.7 Carry out deliver to the retail outlets as per storage instructions.
4.8 Carry out shelf life test with at least two samples from each batch.
4.9 Send periodic batch samples of yogurt to accredited food testing laboratory for testing.

## 5. Documentation

5.1 Production sheet
5.2 Lot/Batch Numbers of raw material used during processing,
5.3 Keeping quality record
5.4 Daily and weekly Cleaning log sheet

## 6. Reference

6.1 For performing platform milk tests, refer to poster on Platform Milk Test, National Dairy Research Centre, Yusipang
6.2 For operation of cream separator, refer to poster on Operation Manual for Cream Separator, National Dairy Research Centre, Yusipang

## STANDARD OPERATING PROCEDURE FOR MANUFACTURE OF PANEER

### Purpose

To ensure production of Paneer following proper Good Manufacturing Practices and to prevent food quality/safety issues.

### Scope

Shall apply to Milk Processing Units (MPUs)/Dairy Processing Plants (DPPs) during production of the specified product.

### Safety and Environmental Consideration

Follow instructions for use and always be careful when working with hot water and chemical cleaners.

The disposal of by products, milk restudies and waste should follow norms as prescribed by the National Environment Commission.

### 1. Responsibility

1.1 Staff should be trained in milk sampling, platform milk tests and to maintain proper documentation to ensure milk quality during milk reception.

1.2 Staff should be trained in operation of equipment and should maintain proper documentation during production as per production log sheet.

1.3 Plant manager/Supervisors/Group Chairman should ensure proper record maintenance of all activities to be presented to group members, regulatory body (BAFRA) and respective Dzongkhag Livestock Offices as and when required.

### 2. Raw Materials

2.1 Raw Milk

2.2 Food Grade Acetic Acid/Citric Acid

## 3. Equipment

3.1 Milk Analyzer
3.2 Alkaline Phosphate Test Kit
3.3 Milk Storage Tank
3.4 Cream Separator
3.5 Homogenizer
3.6 Batch Pasteurizer
3.7 Steam Generator/Steam Boiler
3.8 Cold Store
3.9 Cheese Cloth/Strainer
3.10 Cheese Moulds/Chees Hoops
3.11 Cheese Press (Manual/Pneumatic)
3.12 Cheese Cutter (Manual/automatic)

## 4. Procedures

### 4.1 Milk reception and testing

4.1.1 Refer to SOP for Receiving Raw Milk.

### 4.2 Standardization

4.2.1 Standardize to required fat and SNF content.
Standardization is carried out with addition of calculated amount of skim milk/milk solids or removal of cream.
4.2.2 Pre heat the milk to 40-45°C for separation of cream and/or skim milk
4.2.3 Homogenize at 2000 to 2500 psi at 60-70°C.

### 4.3 Processing

4.3.1 Continue heating (pasteurization) standardized milk to 90°C/no hold.
4.3.2 Draw a representative sample of pasteurized milk and perform alkaline phosphate test to check for proper pasteurization of milk. (Positive test indicates that milk has not been pasteurized).
4.3.3 Cool milk to 70°C (for buffalo milk) and 85°C (for cow milk).

4.3.4 Add acid (1% citric acid) into milk with gentle stirring until clear whey separation.

4.3.5 Hold for 3 - 5 minutes to facilitate whey separation.

4.3.6 Drain whey using cheese cloth to collect the curd.

4.3.7 Transfer the curd into moulds/hoops lined with cloth and place under cheese pressing machine

0.0.1 Apply specific pressure (@ rate of 0.5-1 kg/cm$^2$) for 10 - 20 minutes to obtain final paneer with moisture content of maximum 60% by mass. Determine moisture content as per the procedure prescribed in BSB standards.

0.0.2 Remove from mould/hoop and place in potable chilled water (4 - 6$^o$C) 2 - 3 hours.

0.0.3 Remove and allow water to drain for 10 - 15 mins.

0.0.4 Cut into desired cubes manually or using cheese cutting machine.

0.0.5 Pack into desired packaging material with batch number and manufacture date.

0.0.6 Store under refrigerated conditions or as per storage instructions on the label.

0.0.7 Carry out shelf life test with at least two samples from each batch.

0.0.8 Send periodic batch samples of yogurt to accredited food testing laboratory for testing.

## 1. Documentation

1.1 Milk reception record

1.2 Platform test and other tests record

1.3 Milk standardization record

1.4 Paneer production sheet

1.5 Pasteurization record

1.6 Lot/Batch Numbers of raw material used during processing,

1.7 Cold store Temperature recording sheet

1.8 Keeping quality record

1.9 Daily and weekly Cleaning log sheet

## 2. Reference

2.1 For performing platform milk tests, refer to poster on Platform Milk Test, National Dairy Research Centre, Yusipang

2.2 For operation of cream separator, refer to poster on Operation Manual for Cream Separator, National Dairy Research Centre, Yusipang

2.3 Bhutan Standard Paneer BTS 301: 2020 IS 10484:1983, Bhutan Standards Bureau.

**NATIONAL DAIRY RESEARCH & DEVELOPMENT CENTRE**
**DEPARTMENT OF LIVESTOCK**
**MINISTRY OF AGRICULTURE AND FORESTS**
**YUSIPANG, THIMPHU, BHUTAN, POST BOX: 1058**
**17116985 (Direct), 17116986 (Lab), 17116976 (PABX)**
**www.ndrc.gov.bt**