



RQF LEVEL 3



FOPFM303

FOOD PROCESSING

Fermented Milk Production

TRAINER'S MANUAL

October, 2024



FERMENTED MILK PRODUCTION



AUTHOR'S NOTE PAGE (COPYRIGHT)

The competent development body of this manual is Rwanda TVET Board ©, reproduce with permission.

All rights reserved.

- This work has been produced initially with the Rwanda TVET Board with the support from KOICA through TQUM Project
- This work has copyright, but permission is given to all the Administrative and Academic Staff of the RTB and TVET Schools to make copies by photocopying or other duplicating processes for use at their own workplaces.
- This permission does not extend to making of copies for use outside the immediate environment for which they are made, nor making copies for hire or resale to third parties.
- The views expressed in this version of the work do not necessarily represent the views of RTB. The competent body does not give warranty nor accept any liability
- RTB owns the copyright to the trainee and trainer's manuals. Training providers may reproduce these training manuals in part or in full for training purposes only. Acknowledgment of RTB copyright must be included on any reproductions. Any other use of the manuals must be referred to the RTB.

© **Rwanda TVET Board**

Copies available from:

- *HQs: Rwanda TVET Board-RTB*
- *Web: www.rtb.gov.rw*
- **KIGALI-RWANDA**

Original published version: October 2024

ACKNOWLEDGEMENTS

The publisher would like to thank the following for their assistance in the elaboration of this training manual:

Rwanda TVET Board (RTB) extends its appreciation to all parties who contributed to the development of the trainer's and trainee's manuals for the TVET Certificate III in Food Processing, specifically for the module "**Fermented Milk Production** "

We extend our gratitude to KOICA Rwanda for its contribution to the development of these training manuals and for its ongoing support of the TVET system in Rwanda.

We extend our gratitude to the TQUM Project for its financial and technical support in the development of these training manuals.

We would also like to acknowledge the valuable contributions of all TVET trainers and industry practitioners in the development of this training manual.

The management of Rwanda TVET Board extends its appreciation to both its staff and the staff of the TQUM Project for their efforts in coordinating these activities.

This training manual was developed:

Under Rwanda TVET Board (RTB) guiding policies and directives



Under Financial and Technical support of



COORDINATION TEAM

RWAMASIRABO Aimable

MARIA Bernadette M. Ramos

NTAHONTUYE Felix

Production Team

Authoring and Review

NSHUTIYIMANA Abel

AYEBARE Honoree

Validation

GIRANEZA Marie Jeanne

NDUWAYEZU Jean Claude

Conception, Adaptation and Editorial works

HATEGEKIMANA Olivier

GANZA Jean Francois Regis

HARELIMANA Wilson

NZABIRINDA Aimable

DUKUZIMANA Therese

NIYONKURU Sylvestre

NIYOMUGABO Silas

Formatting, Graphics, Illustrations, and infographics

YEONWOO Choe

SUA Lim

SAEM Lee

SOYEON Kim

WONYEONG Jeong

AMIZERO Patrick

Financial and Technical support

KOICA through TQUM Project

TABLE OF CONTENT

AUTHOR'S NOTE PAGE (COPYRIGHT)-----	iii
ACKNOWLEDGEMENTS-----	iv
TABLE OF CONTENT -----	vii
ACRONYMS-----	viii
INTRODUCTION -----	1
MODULE CODE AND TITLE: FOPFM303 FERMENTED MILK PRODUCTION-----	2
Learning Outcome 1: Prepare Workplace-----	3
Key Competencies for Learning Outcome 1: Prepare Workplace -----	4
Indicative content 1.1: Selection of Materials, Tools and Equipment -----	7
Indicative content 1.2: Arrangement of Workplace -----	11
Indicative content 1.3: Preparation of ingredients for fermented milk -----	15
Learning outcome 1 end assessment -----	17
Further information to the trainer-----	20
Learning Outcome 2: Ferment the Milk -----	21
Key Competencies for Learning Outcome 2 : Ferment the milk -----	22
Indicative content 2.1: Pasteurize the milk -----	25
Indicative content 2.2: Milk cooling according to the product specification-----	30
Indicative content 2.3: Incubation of inoculated milk-----	33
Learning outcome 2 end assessment -----	37
Further information to the trainer-----	40
Learning Outcome 3: Store Fermented Milk -----	41
Key Competencies for Learning Outcome 3: Store Fermented Milk -----	42
Indicative content 3.1: Preparation of packaging materials -----	44
Indicative content 3.2: Packaging of fermented milk products -----	47
Indicative content 3.3: Monitoring of storage conditions of fermented milk-----	50
Learning outcome 3 end assessment -----	53
Further information to the trainer-----	57

ACRONYMS

%: Percentage

°C: Celsius

°F: Degree Fahrenheit

AGR: Agriculture

CBC: Competence Based Curriculum

CBT/A: Competency-Based Training /Assessment

CIP: Cleaning In Place

COP: Cleaning Out of Place

FM: Fermented Milk

FOP: Food Processing

HDPE: High Density Polyethylene

IC: Indicative Content

Kg: Kilogram

L: Litre

Ltd.: limited

pH: potential Hydrogen

PPE: Personal Protective Equipment

RQF: Rwanda Qualification Framework

RTB: Rwanda TVET Board

SOP: Standard Operating Procedure

TQUM: TVET Quality Management

TVET: Technical and Vocational Education and Training

INTRODUCTION

This trainer's manual includes all the methodologies required to effectively deliver the module titled "**Fermented Milk Production.**" Trainees enrolled in this module will engage in practical activities designed to develop and enhance their competencies.

The development of this training manual followed the Competency-Based Training and Assessment (CBT/A) approach, offering ample practical opportunities that mirror real-life situations.

The trainer's manual is organized into Learning Outcomes, which is broken down into indicative content that includes both theoretical and practical activities. It provides detailed information on the key competencies required for each learning outcome, along with the objectives to be achieved.

As a trainer, you will begin by asking questions related to the activities to encourage critical thinking and guide trainees toward real-world applications in the labour market. The manual also outlines essential information such as learning hours, didactic materials, and suggested methodologies.

This manual outlines the procedures and methodologies for guiding trainees through various activities as detailed in their respective trainee manuals. The activities included in this training manual are designed to offer students opportunities for both individual and group work. Upon completing all activities, you will assist trainees in conducting a formative assessment known as the end learning outcome assessment. Ensure that students review the key reading and the points to remember section.

MODULE CODE AND TITLE: FOPFM303 FERMENTED MILK PRODUCTION

Learning Outcome 1: Prepare workplace

Learning Outcome 2: Ferment the milk

Learning Outcome 3: Store fermented milk

Learning Outcome 1: Prepare Workplace



Indicative contents

1.1 Selection of materials, tools and equipment

1.2 Arrangement of workplace

1.3 Preparation of ingredients for fermented milk

Key Competencies for Learning Outcome 1: Prepare Workplace

Knowledge	Skills	Attitudes
<ul style="list-style-type: none">• Description of materials, tools and equipment used in fermented milk making• Description of methods and techniques of cleaning the workplace, tools and equipment• Description of fermented milk production process• Explanation of work area arrangement purpose• Description of Ingredients ratio	<ul style="list-style-type: none">• Selecting of materials, tools and equipment• Adjusting tools and equipment• Cleaning of workplace, tools and equipment• Arranging workplace• Calculating and weighing ingredients	<ul style="list-style-type: none">• Being careful when selecting materials, tools and equipment• Being careful when adjusting tools and equipment• Being attentive when cleaning workplace, tools and equipment• Being well organized when arranging workplace• Being accurate when calculating and weighing ingredients



Duration: 10 hrs

Learning outcome 1 objectives:



By the end of the learning outcome, the trainees will be able to:

1. Describe correctly the cleaning products according to the intended use
2. Describe correctly the ingredients according to their product specification
3. Select and adjust properly tools and equipment according to the intended use
4. Clean properly work place, tools and equipment according to the protocol
5. Describe correctly the production process according to the product type
6. Calculate and weigh accurately the ingredients according the ingredients ratios



Resources

Equipment	Tools	Materials
<ul style="list-style-type: none"> • Milk cooling tanks • Pasteurizers • Refrigerator • Freezer • Incubation vats • PPE • Packaging machine • Sealing machine • Labelling machine • Pressure cleaners • Gas cookers • Electronic balance • Mechanical balance 	<ul style="list-style-type: none"> • Thermometer • pH meter • Milk can • Stirrer • Stainless steel table • Sauce pans • Buckets • Spoon • Beakers • Brushes • Mopes • Squeegees • Towels • Gloves • Filters • Sweeper • Basin • Waste bins 	<ul style="list-style-type: none"> • Raw milk • Mesophilic and thermophilic starter cultures • Sugar • Flavours • Stabilizers • Sodium hydroxide • Liquid soaps • Solid soaps • Chalks • Papers • Alcohol • Gloves • Labels • Disinfectants • Water • Gas • Packaging materials • Flip chart • Mark pen • Aluminium foil • Scotch • Glue

		<ul style="list-style-type: none">• Fire• Extinguisher• First aid kit
 Advance Preparation: Before delivering this learning outcome, you are recommended to: <ul style="list-style-type: none">• Avail a classroom and workshop• Avail materials, tools and equipment and make sure that they are in good working condition and verify if materials are not expired• Prepare teaching aids and didactic materials (manuals/guides, task sheets, photos, audio-visuals, protocols)		



Indicative content 1.1: Selection of Materials, Tools and Equipment



Duration:4hrs



Theoretical Activity 1.1.1: Identification of materials used in fermented milk



Notes to the trainer:

Trainer may use small groups to identify materials used in fermented milk production
The use of pictures or videos as didactic materials is required



Key steps:

While delivering this activity, pass through the following steps:

- Step 1** Introduce the activity and ask trainees to answer the following questions:
- What should be the cleaning products used in fermented milk production?
 - While producing fermented milk, different ingredients are used, what are them?
- Step 2** Monitor discussions in groups and ask trainees to write their findings on papers, flip chart, blackboard or white board.
- Step 3** Asks trainees to discuss on the provided answers and choose the correct ones.
- Step 4** Provide the expert view and clarify ideas by using didactic materials.
- Step 5** Address any questions or concerns.
- Step 6** Ask trainees to read the key reading 1.1.1 in trainee manual



Points to Remember

- Water is cleaning product which also be used to rinse out dirt removed from a surface by other cleaning agents.
- In all ingredients used in fermented milk production raw milk is main ingredient because all other ingredients refer to raw milk
- Milk protein is composited by casein about 80% and whey protein or serum about 20%.
- Mesophilic starter culture has optimum growth temperature of 30⁰c
- Thermophilic starter culture has optimum growth temperature of 40⁰c



Theoretical Activity 1.1.2: Identification of tools and equipment used in fermented milk production



Notes to the trainer:

- Trainer may use small groups to identify tools and equipment used in fermented milk production
- The use of pictures or videos as didactic materials is required



Key steps:

While delivering this activity, pass through the following steps:

- Step 1** Introduce the activity and ask trainees to answer the following questions:
- i. While cleaning workplace there are many tools and equipment you can use, what are them?
 - ii. While producing fermented milk products there are many tools and equipment you can use, what are them?
- Step 2** Monitor discussions in groups and ask trainees to write their findings on papers, flip chart, blackboard or white board.
- Step 3** Asks trainees to discuss on the provided answers and choose the correct ones.
- Step 4** Provide the expert view and clarify ideas by using didactic materials.
- Step 5** Address any questions or concerns.
- Step 6** Ask trainees to read the key reading 1.1.2 in trainee manual



Points to Remember

- Each tool and equipment has its function but some can be used in more than one function **example:** Lacto scan used for measuring freezing point of fat, Solid Non Fat, proteins, density, lactose, salts and temperature.
- While using tools and equipment better to respect all safety precautions for preventing some accident, injury which can cause death.



Practical Activity 1.1.3: Selecting and adjusting tools and equipment



Notes to the trainer

- The trainer is supposed to demonstrate how to select and adjust tools and equipment used in fermented milk production.
- For the effective delivery; it is recommended to avail tools and equipment to be selected



Key steps:

While delivering this activity, pass through the following steps:

Step 1 Introduce the activity and ask trainees to do the task described below:

You are asked to select and adjust tools and equipment used in fermented milk production according to their usage and tools/equipment manual

Step 2 Explain the task and provide clear work instruction (Task, PPE, Time allocated)

Step 3 Demonstrate how to select and adjust tools and equipment used in fermented milk production. While demonstrating, explain the procedures.

Step 4 Ask trainees to select and adjust tools and equipment used in fermented milk production and monitor the procedures.

Step 5 Verify whether tools and equipment used in fermented milk production are well selected and adjusted, and provide feedback where necessary.

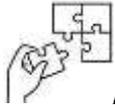
Step 6 Ask trainees to read key reading 1.1.3 in trainee manual

Step 7 Ask trainees to perform the task provided in application of learning 1.1



Points to Remember

- Select tool or equipment based on the task to work on
- Some tools and equipment need to be adjusted before use and others don't
- While adjusting tools and equipment follow manufacturer manuals



Application of learning 1.1.

Ask learner to go in school workshop for fermented milk production to select and adjust tools and equipment used in fermented milk production.

Checklist

SN	Criteria	Indicator	Score	
			Yes	No
1	Tools and equipment are properly selected and adjusted	Selection criteria are considered		
		Selection steps are considered		
		Adjustment procedures are respected		



Indicative content 1.2: Arrangement of Workplace



Duration: 3 hrs



Practical Activity 1.2.1: Cleaning of workplace tools and equipment used in fermented milk production



Notes to the trainer

- The trainer is supposed to demonstrate how to clean workplace, tools and equipment
- For the effective delivery it is recommended to:
 - ✓ Avail uncleaned workplace, tools and equipment to be cleaned
 - ✓ Avail cleaning protocol



Key steps:

While delivering this activity, pass through the following steps:

- Step 1** Introduce the activity and ask trainees to clean workplace, tools and equipment used in fermented milk production according to the protocol.
- Step 2** Explain the task and provide clear work instruction (Task, PPE, Time allocated)
- Step 3** Demonstrate how to clean workplace, tools and equipment used in fermented milk production. While demonstrating, explain the procedures.
- Step 4** Ask trainees to clean workplace, tools and equipment used in fermented milk production and monitor the procedures.
- Step 5** Verify whether the workplace, tools and equipment used in fermented milk production are well cleaned, and provide feedback where necessary.
- Step 6** Ask trainees to read key reading 1.2.1 in trainee manual
- Step 7** Ask trainees to perform the task provided in application of learning 1.2



Points to Remember

- It is a must to respect temperature and ratio of cleaning product in cleaning to ensure the effectiveness of cleanliness
- While cleaning workplace follow these steps: pre-rinsing, caustic treatment, intermediate rinsing, acidic treatment, intermediate rinsing, disinfection and final rinsing



Theoretical Activity 1.2.2: Description of purpose of work area arrangements



Notes to the trainer:

- Trainer may use small groups to describe purpose of work area arrangements
- The use of pictures or videos as didactic materials is required



Key steps:

While delivering this activity, pass through the following steps:

- Step 1: Introduce the activity and ask trainees to answer the following questions:
Why is it important to arrange work area in fermented milk production?
- Step 2: Monitor discussions in groups and ask trainees to write their findings on papers, flip chart, blackboard or white board.
- Step 3: Asks trainees to discuss on the provided answers and choose the correct ones.
- Step 4: Provide the expert view and clarify ideas by using didactic materials.
- Step 5: Address any questions or concerns.
- Step 6: Ask trainees to read the key reading 1.2.2 in trainee manual



Points to Remember

- While arranging work area make sure that all to be arranged are cleaned



Theoretical Activity 1.2.3: Description of work area layout (production process)



Notes to the trainer:

- Trainer may use small groups to describe work area layout (production process)
- The use of chart or videos as didactic materials is required



Key steps:

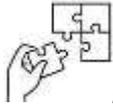
While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to answer the following questions:
How can you design fermented milk production layout?
- Step 2:** Monitor discussions in groups and ask trainees to write their findings on papers, flip chart, blackboard or white board.
- Step 3:** Asks trainees to discuss on the provided answers and choose the correct ones.
- Step 4:** Provide the expert view and clarify ideas by using didactic materials.
- Step 5:** Address any questions or concerns.
- Step 6:** Ask trainees to read the key reading 1.2.3 in trainee manual



Points to Remember

- In production of IKIVUGUTO and yoghurt follow all process don't miss any one in order to get a product with good quality



Application of learning 1.2.

Ask learner to identify and visit any dairy in his/her community, to observe:

- I. How they clean workplace, tools and equipment,
- II. How they arrange work area and
- III. Production process they use while making IKIVUGUTO and yoghurt. Produce a visit report.

Checklist

SN	Criteria	Indicator	Score	
			Yes	No
1	Work area, tools and equipment are well arranged	Dairy was identified		
		Cleaning of work area tools and equipment was observed		
		Arrangement of work area, tools and equipment was observed		
2	Production process is well observed	Production process of IKIVUGUTO was observed		
		Production process of yoghurt was observed		
		A visit report was produced		



Indicative content 1.3: Preparation of ingredients for fermented milk



Duration: 3 hrs



Practical Activity 1.3.1: Weighing ingredients



Notes to the trainer

- The trainer is supposed to demonstrate how to weigh the ingredients
- The availability of tools and equipment for weighing ingredients is required



Key steps:

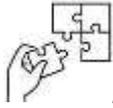
While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to weigh the ingredients used in production of yoghurt and IKIVUGUTO
- Step 2:** Explain the task and provide clear work instruction (PPE, Time allocated)
- Step 3:** Demonstrate how to weigh the ingredients used in production of yoghurt and IKIVUGUTO. While demonstrating, explain the procedure.
- Step 4:** Ask trainees to weigh the ingredients used in production of yoghurt and IKIVUGUTO and monitor the procedure.
- Step 5:** Verify whether the ingredients used in production of yoghurt and IKIVUGUTO are well weighed, and provide feedback where necessary.
- Step 6:** Ask trainees to read key reading 1.3.1 in trainee manual
- Step 7:** Ask trainees to perform the task provided in application of learning 1.3



Points to Remember

- During weighing the ingredients, you must respect the ratio of each ingredient
- The amount of other ingredients used to produce IKIVUGUTO and yoghurt depends on the quantity of raw milk.



Application of learning 1.3.

Ask learner to go in school workshop for fermented milk production to calculate and weigh the ingredients used in making IKIVUGUTO and yoghurt.

Checklist

SN	Criteria	Indicator	Score	
			Yes	No
1	Ingredients are well calculated and weighed	Ingredient's ratios of IKIVUGUTO are respected		
		Ingredient's ratios of yoghurt are respected		
		Calculation is done		
		Weighing of ingredients is done		



Learning outcome 1 end assessment

Written assessment

Q1. Underline tools used in fermented milk production and cleaning work area

- a) Freezer
- b) Plastic bottles
- c) Sauce pan
- d) Bucket
- e) Stabilisers
- f) Mopes
- g) Squeegees

Answer:

- a) **Freezer**
- b) **Plastic bottles**
- c) **Sauce pan**
- d) **Bucket**
- e) **Stabilisers**
- f) **Mopes**
- g) **Squeegees**

Q2. Answer by True if the given statement is correct or False if the given statement is incorrect

- a) The main ingredient used in fermented milk production is stabilizer **false**
- b) Both beakers and sugar are the ingredients used in fermented milk production **false**
- c) Flavouring agent used in fermented milk products to provide colour of milk **false**
- d) Is it necessary to identify the problem while you are adjusting the tools and equipment? **True**

Q3. During cleaning workplace, tools and equipment used in fermented milk production the cleaning products are used for proper cleanliness. List two types of cleaning products.

Answer:

- **Types of cleaning product**
- **Water**
- **General purpose or neutral detergents**
- **Sanitizers**
- **Hard surface cleaners**
- **Solvents (degreasers)**
- **Abrasive powders.**

Q4. Complete the sentence below with given appropriate term (refrigerator, homogenization, packaging, filling, cooling, inoculation, flavouring)

- a) The milk is subjected to high-pressure homogenization to break down fat globules and achieve a uniform milk texture. This step prevents cream separation

Answer: Homogenization

- b) The fermented milk product is filled into containers, which can include cups, bottles, or cartons, depending on the product type

Answer: Filling

- c) used to cool milk after incubation in order to stop fermentation process or slow down the activity of microorganisms.

Answer: Refrigerator

Q5. CIP is one of technique used in cleaning of equipment in fermented milk production. Enumerate the steps to follow in performing this technique.

Answer:

Steps of CIP

- Rinsing with warm water for about 10 minutes.
- Circulation of an alkaline detergent solution (0.5 – 1.5%) for about 30 minutes at 75°C.
- Rinsing out alkaline detergent with warm water for about 5 minutes.
- Circulation of (nitric) acid solution (0.5 – 1.0 %) for about 20 minutes at 70°C.
- Post-rinsing with cold water.

Practical assessment

SAWA -SAWA dairy ltd located in MUSANZE District processes fresh milk and it has a problem of distributing fermented milk products (IKIVUGUTO and yoghurts) don't meet the customer preferences as claimed by the customers. Production manager of this dairy found the root cause of this problem is low skilled labour who don't know how to prepare the workplace and ingredients to use in IKIVUGUTO and yoghurt. As a skilled trainee, you are requested to solve this problem by performing the following tasks:

Task 1: Select materials, tools and equipment

Task 2: Arrange the workplace

Task 3: Prepare ingredients used to make IKIVUGUTO and yoghurt

N.B:

- ❖ During preparation of ingredients use 100L of raw milk for IKIVUGUTO and 100L of raw milk for yoghurt
- ❖ All resources needed are available in the work area
- ❖ Time to accomplish the activity is 5hours

Check list

SN	Criteria	Indicator	Score	
			Yes	No
1	Materials, tools and equipment are properly selected and adjusted	Ingredients are selected		
		Tools and equipment for cleaning are selected		
		Cleaning products are selected		
		Tools and equipment for production are adjusted		
2	Workplace is well arranged	Cleaning methods are applied		
		Cleaning techniques are applied		
		Workplace is arranged		
3	Ingredients are properly prepared	Ingredients for IKIVUGUTO are calculated		
		Ingredients for IKIVUGUTO are weighed		
		Ingredients for yoghurt are calculated		
		Ingredients for yoghurt are weighed		
		Duration was respected		

END



Further information to the trainer

Aneja, R.P. Mathur, B.N., Chandarn, R.C. and Bajerjee, A.K. (2002). Technology of Indian milk products, Dairy India Publications.

Bereda, A., Yilma, Z., & Nurfeta, A. (2012). Hygienic and microbial quality of raw whole cow's milk produced in Ezha district of the Gurage zone, Southern Ethiopia. Wudpecker Journal of Agricultural Research, 1(11), 459-465.

Chandan, R.C. and Kilara, A. eds., 2013. Manufacturing yogurt and fermented milks (pp. 294- 295) Wiley-Blackwell.

Oyeyinka, A. T., Makhuvele, R., Olatoye, K. K., & Oyeyinka, S. A. (2023). African fermented dairy-based products. In Indigenous Fermented Foods for the Tropics (pp. 169-188). Academic Press.

Roslin, E.N., Ong, G. and Dawal, S.Z., (2008). A study on facility layout in manufacturing production line using WITNESS. In Proceedings of the 9th Asia Pasific Industrial Engineering & Management System Conference (pp. 412-421).

Tamine, AY. &ROBINSON R. K (2007). Yoghurt science and technology (2nd ed) wood head Publishing.

Learning Outcome 2: Ferment the Milk



Indicative contents

2.1 Pasteurize the milk

2.2 Milk cooling according to the product specification

2.3 Incubation of inoculated milk

Key Competencies for Learning Outcome 2 : Ferment the milk

Knowledge	Skills	Attitudes
<ul style="list-style-type: none"> • Description of types of yoghurt • Identification of the purposes of milk standardization • Explanation of milk standardization techniques • Identification of the purpose of milk homogenization • Explanation of homogenization conditions and procedures • Description on checking the pasteurization effectiveness • Identification of purpose of cooling and inoculating the milk • Identification of incubation conditions of fermented milk products • Description of quality parameters of fermented milk 	<ul style="list-style-type: none"> • Adding ingredients into the milk • Homogenizing the milk • Standardizing the milk • Checking the effectiveness of pasteurization • Cooling and inoculating milk for IKIVUGUTO and yoghurt production • Incubating inoculated milk • Checking the quality of fermented milk 	<ul style="list-style-type: none"> • Being respective when adding ingredients into the milk • Being careful when homogenizing the milk • Being careful when standardizing the milk • Being careful when checking the effectiveness of pasteurization • Being attentive when cooling and inoculating milk for IKIVUGUTO and yoghurt production • Being attentive when incubating inoculated milk • Being careful when checking the quality of fermented milk



Duration: 40 hrs

Learning outcome 2 objectives:



By the end of the learning outcome, the trainees will be able to:

1. Describe correctly the types of yoghurt according to the ingredients and incubation
2. Perform properly milk standardization according to the milk standardization techniques
3. Perform properly milk homogenisation according to the homogenisation procedures
4. Check correctly pasteurization effectiveness according to the checking methods
5. Cool and inoculate properly milk according to the type of product
6. Incubate properly inoculated milk according to the type of product
7. Check correctly the quality parameters according to the product standard



Resources

Equipment	Tools	Materials
<ul style="list-style-type: none"> • Milk cooling tanks • Pasteurizers • Homogenizer • Incubator • Milk cans • Black board • Projector • Computer • Tables • Incubation vats • PPEs, • sealer 	<ul style="list-style-type: none"> • Thermometer • pH meter • Stirrer • Sauce pans • Buckets • Spoons • Electronic balance • Mechanical balance, • Beakers • Filters 	<ul style="list-style-type: none"> • Raw milk • Starter cultures • Sugar • Flavours • Stabilizers • Papers • Gloves • Water • Gas • Bottles • Colouring agent



Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Avail a classroom and workshop
- Avail materials, tools and equipment and make sure that they are in good working condition and verify if materials are not expired

- Prepare teaching aids and didactic materials (manuals/guides, task sheets, photos, audio-visuals, protocols)



Indicative content 2.1: Pasteurize the milk



Duration: 25 hrs



Theoretical Activity 2.1.1: Description of types of yoghurt



Notes to the trainer:

- Trainer may use small groups to describe types and uses of ingredients
- The use of pictures or videos as didactic materials is required.



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to answer the following question:
What should be the types of yoghurt based on ingredients used and how incubation is performed
- Step 2:** Monitor discussions in groups and ask trainees to write their findings on papers, flip chart, blackboard or white board.
- Step 3:** Asks trainees to discuss on the provided answers and choose the correct ones.
- Step 4:** Provide the expert view and clarify ideas by using didactic materials.
- Step 5:** Address any questions or concerns.
- Step 6:** Ask trainees to read the key reading 2.1.1 in trainee manual



Points to Remember

- When classifying yoghurt, consider the ingredients used and performed incubation
- In making plain yoghurt is a must to use only raw milk and yoghurt starter culture



Practical Activity 2.1.2: Performing milk standardization



Notes to the trainer

- The trainer is supposed to demonstrate how to perform milk standardization
- For the effective delivery it is recommended to:
 - ✓ Avail milk to be used
 - ✓ Avail tools and equipment that shall help to perform milk standardization



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to standardize milk
- Step 2:** Explain the task and provide clear work instruction (Task, PPE, Time allocated)
- Step 3:** Demonstrate how to standardize milk. While demonstrating, explain the procedures.
- Step 4:** Ask trainees to standardize milk and monitor the procedures.
- Step 5:** Verify whether milk have been well standardized, and provide feedback where necessary.
- Step 6:** Ask trainees to read key reading 2.1.2 in trainee manual
- Step 7:** Ask trainees to perform the task provided in application of learning 2.1



Points to Remember

- Respect all techniques used in milk standardization: milk separation, calculating the amount of cream and skim milk, mixing cream and skim milk, verifying fat content
- Skim milk has 0.3% of fat
- Achieving fat content required is the main purpose of milk standardization



Practical Activity 2.1.3: Performing milk homogenisation



Notes to the trainer

- The trainer is supposed to demonstrate how to perform milk homogenisation
- For the effective delivery it is recommended to:
 - ✓ Avail milk to be homogenized
 - ✓ Avail workplace, tools and equipment where milk shall be homogenized



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to homogenize milk that shall be used for producing IKIVUGUTO and yoghurt
- Step 2:** Explain the task and provide clear work instructions (Task, PPE, Time allocated)
- Step 3:** Demonstrate how to homogenize milk that shall be used for producing IKIVUGUTO and yoghurt. While demonstrating, explain the procedures.
- Step 4:** Ask trainees to homogenize milk that shall be used for producing IKIVUGUTO and yoghurt and monitor the procedures.
- Step 5:** Verify whether milk used for producing IKIVUGUTO and yoghurt is well homogenized, and provide feedback where necessary.
- Step 6:** Ask trainees to read key reading 2.1.3 in trainee manual
- Step 7:** Ask trainees to perform the task provided in application of learning 2.1



Points to Remember

- Follow all steps used in milk homogenisation: pumping the standardized milk into a homogenizer machine, apply high-pressure treatment, emulsion formation and cooling.
- While homogenizing milk use pressure of 150-200 bar and temperature of 58-60°C
- Size reduction of fat globules is the main purpose of milk homogenisation



Practical Activity 2.1.4: Checking the effectiveness of pasteurization



Notes to the trainer

- The trainer supposed to demonstrate how to check the pasteurization effectiveness
- For the effective delivery it is recommended to:
 - ✓ Avail milk that has been pasteurized to use
 - ✓ Avail workplace, tools and equipment where milk shall be checked for effective pasteurization.



Key steps:

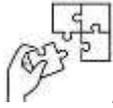
While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to check effectiveness of pasteurization.
- Step 2:** Explain the task and provide clear work instruction (Task, PPE, Time allocated)
- Step 3:** Demonstrate how to check effectiveness of pasteurization. While demonstrating, explain the procedures.
- Step 4:** Ask trainees to check effectiveness of pasteurization and monitor the procedures.
- Step 5:** Verify whether effectiveness of pasteurization is well checked and provide feedback where necessary.
- Step 6:** Ask trainees to read key reading 2.1.4 in trainee manual
- Step 7:** Ask trainees to perform the task provided in application of learning 2.1



Points to Remember

- In organoleptic test:
 - ✓ Smell and taste of milk must be free from burnt flavour
 - ✓ Milk should be free from any other physical contaminants.
- In alkaline phosphatase test, if phosphatase is present after pasteurization, this may indicate that the pasteurization has not been adequate, or there has been contamination after pasteurization.



Application of learning 2.1.

Ask learner to identify and visit any dairy in his/her community, to observe how they standardize the milk, homogenize milk and how they check milk pasteurization effectiveness. Produce a visit report.

Checklist

SN	Criteria	Indicator	Score	
			Yes	No
1	Milk is well standardized and homogenised	Dairy was identified		
		Standardization steps were observed		
		Temperature of 58-60 ⁰ c is used		
		Pressure of 150-200 bar is used		
2	Milk is well checked	Organoleptic test is conducted		
		Alkaline phosphatase test is conducted		
		A visit report was produced		



Indicative content 2.2: Milk cooling according to the product specification



Duration: 5hrs



Practical Activity 2.2.1: Cooling and inoculating milk for IKIVUGUTO making



Notes to the trainer

- The trainer is supposed to demonstrate how to cool and inoculate milk
- For the effective delivery it is recommended to:
 - ✓ Avail pasteurized milk that will be cooled and inoculated for IKIVUGUTO making
 - ✓ Avail workplace where pasteurized milk will be cooled and inoculated



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to cool and inoculate milk that will be used for IKIVUGUTO making
- Step 2:** Explain the task and provide clear work instruction (Task, PPE, Time allocated)
- Step 3:** Demonstrate how to cool and inoculate milk that will be used for IKIVUGUTO making. While demonstrating, explain the procedures.
- Step 4:** Ask trainees to cool and inoculate milk that will be used for IKIVUGUTO making and monitor the procedures.
- Step 5:** Verify whether the pasteurized milk is well cooled and inoculated and provide feedback where necessary.
- Step 6:** Ask trainees to read key reading 2.2.1. in trainee manual
- Step 7:** Ask trainees to perform the task provided in application of learning 2.2



Points to Remember

- While performing all procedures of cooling and inoculating the milk sterilize the workplace and sanitize yourself to avoid cross contamination
- Inoculation temperature of IKIVUGUTO is 20-35°C



Practical Activity 2.2.2: Cooling and inoculating milk for yoghurt making



Notes to the trainer

- The trainer is supposed to demonstrate how to cool and inoculate milk
- For the effective delivery it is recommended to:
 - ✓ Avail pasteurized milk that will be cooled and inoculated for yoghurt making
 - ✓ Avail workplace where pasteurized milk will be cooled and inoculated



Key steps:

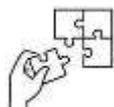
While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to cool and inoculate milk that will be used for yoghurt making
- Step 2:** Explain the task and provide clear work instruction (Task, PPE, Time allocated)
- Step 3:** Demonstrate how to cool and inoculate milk that will be used for yoghurt making. While demonstrating, explain the procedures.
- Step 4:** Ask trainees to cool and inoculate milk that will be used for yoghurt making and monitor the procedures.
- Step 5:** Verify whether the pasteurized milk is well cooled and inoculated and provide feedback where necessary.
- Step 6:** Ask trainees to read key reading 2.2.2. in trainee manual
- Step 7:** Ask trainees to perform the task provided in application of learning 2.2



Points to Remember

- While performing all procedures of cooling and inoculating the milk sterilize the workplace and sanitize yourself to avoid cross contamination
- Inoculation temperature of yoghurt is 38-45⁰c



Application of learning 2.2.

Ask learner to go in school workshop for fermented milk production to cool and inoculate milk for making IKIVUGUTO and yoghurt.

Checklist

SN	Criteria	Indicator	Score	
			Yes	No
1	Milk is well cooled and inoculated	20 -30 ⁰ c for IKIVUGUTO is used		
		38 -45 ⁰ c for yoghurt is used		
		Procedures of cooling is respected		
		Procedures of inoculating is respected		
		Hygiene is maintained		



Indicative content 2.3: Incubation of inoculated milk



Duration: 10 hrs



Practical Activity 2.3.1: Incubating inoculated milk for IKIVUGUTO production.



Notes to the trainer

- ✓ The trainer is supposed to demonstrate how to incubate inoculated milk for IKIVUGUTO production.
- ✓ For the effective delivery it is recommended to:
 - ✓ Avail inoculated milk that will be incubated
 - ✓ Avail workplace where inoculated milk will be incubated



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to incubate inoculated milk for IKIVUGUTO production.
- Step 2:** Explain the task and provide clear work instruction (Task, PPE, Time allocated)
- Step 3:** Demonstrate how to incubate inoculated milk for IKIVUGUTO production.
- Step 4:** While demonstrating, explain the procedures.
- Step 5:** Ask trainees to incubate inoculated milk for IKIVUGUTO production and monitor the procedures.
- Step 6:** Verify whether inoculated milk is well incubated and provide feedback where necessary.
- Step 7:** Ask trainees to read key reading 2.3.1 in trainee manual
- Step 8:** Ask trainees to perform the task provided in application of learning 2.3



Points to Remember

- While incubating milk to produce IKIVUGUTO monitor temperature of 20-30°C within 10-12 hrs
- Keep milk at 20-30°C until a pH of 4.6 is reached



Practical Activity 2.3.2: Incubating inoculated milk for yoghurt production



Notes to the trainer

- The trainer supposed to demonstrate how to incubate inoculated milk for yoghurt production
- For the effective delivery it is recommended to:
 - ✓ Avail inoculated milk that will be incubated
 - ✓ Avail workplace where inoculated milk will be incubated



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to incubate inoculated milk for yoghurt production.

Step 2: Explain the task and provide clear work instruction (Task, PPE, Time allocated)

Step 3: Demonstrate how to incubate inoculated milk for yoghurt production. While demonstrating, explain the procedures.

Step 4: Ask trainees to incubate inoculated milk for yoghurt production and monitor the procedures.

Step 5: Verify whether inoculated milk is well incubated and provide feedback where necessary.

Step 6: Ask trainees to read key reading 2.3.2 in trainee manual

Step 7: Ask trainees to perform the task provided in application of learning 2.3



Points to Remember

- While incubating milk to produce yoghurt monitor temperature of 38-45⁰c within 3-6 hrs
- Keep milk at 38-45°C until a pH of 4.6 is reached



Practical Activity 2.3.3: Checking the quality parameters of fermented milk



Notes to the trainer

- The trainer supposed to demonstrate how to check the quality parameters of fermented milk
- For the effective delivery it is recommended to:
 - ✓ Avail fermented milk product to check for the quality
 - ✓ Avail workplace where quality of fermented milk product will be checked



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to check the quality parameters of fermented milk products

Step 2: Explain the task and provide clear work instruction (Task, PPE, Time allocated)

Step 3: Demonstrate how to check quality of fermented milk products. While demonstrating, explain the procedures.

Step 4: Ask trainees to check quality of fermented milk products and monitor the procedures.

Step 5: Verify whether quality of fermented milk product is well checked, and provide feedback where necessary.

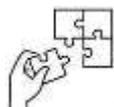
Step 6: Ask trainees to read key reading 2.3.3 in trainee manual

Step 7: Ask trainees to perform the task provided in application of learning 2.3



Points to Remember

- While taking the sample for using in testing don't shake the milk to prevent stopping the fermentation process early
- Follow all procedures of testing the pH: calibrate the pH meter, prepare milk sample, clean the electrode and measure the PH.
- Stir yoghurt/IKIVUGUTO to breakdown the coagulum after testing all recommended test to avoid stopping fermentation early



Application of learning 2.3.

Ask learner to go in school workshop for fermented milk production to incubate inoculated milk for making IKIVUGUTO and yoghurt and to check the quality of fermented milk.

Checklist

SN	Criteria	Indicator	Score	
			Yes	No
1	Inoculated milk is well incubated	20-30 ⁰ c for IKIVUGUTO is monitored		
		38-45 ⁰ c for yoghurt is monitored		
		10-12 hrs for IKIVUGUTO is respected		
		3-6 hrs for yoghurt is respected		
		Incubation procedures is considered		
2	Quality of IKIVUGUTO and yoghurt are well checked	Organoleptic test is conducted		
		pH test is conducted		
		pH of 4.5-4.6 is achieved		



Learning outcome 2 end assessment

Written assessment

1. Fill the appropriate term to the following definitions (Pasteurisation, homogenisation, standardisation, incubation)
 - a) Is the process of adjusting fat percentage in milk and other solid non-fat (SNF) to required level?

Answer: Standardisation

2. Underline the right answer in the following statements

- a) What is the enzyme is tested to determine the effectiveness of pasteurisation?

- i. Lipase
- ii. Amylase

iii. Phosphatase

- iv. Protease

- b) What is the purpose of milk standardisation?

- i. To increase milk's sweetness
- ii. To reduce milk's shelf life
- iii. To adjust the fat percentage in milk
- iv. To add artificial flavourings

v. To adjust the fat percentage and Solid Non-Fat in milk

- c) Homogenization is performed to:

- i. Decrease fat globule size**
- ii. Prevent cream separation
- iii. Decrease the mouth-feel of the product
- iv. Reduce water-holding capacity

- d) Which methods are used for calculating the proportions of cream, skimmed milk, and whole milk for standardisation?

- i. Algebraic method
- ii. Pearson's square method
- iii. Pythagorean theorem

iv. i and ii are correct

- e) What is the type of starter culture used to make yoghurt?

- i. Thermophilic starter culture**
- ii. Mesophilic starter culture

- f) What is the incubation condition of yoghurt?

- i. 38-45⁰c with 3-6hrs**
- ii. 20-35⁰c with 12 hrs

g) What is the normal pH of IKIVUGUTO?

- i. **pH of 4.5-4.6**
- ii. pH of 3-5

3. Answer by True if the given statement is correct or False if the given statement is incorrect

a) The presence of enzyme phosphatase after pasteurisation indicates that the milk has been well pasteurised **False**

b) Ingredients like artificial flavouring agents and colourings are added to yoghurt at the beginning of pasteurisation **False**

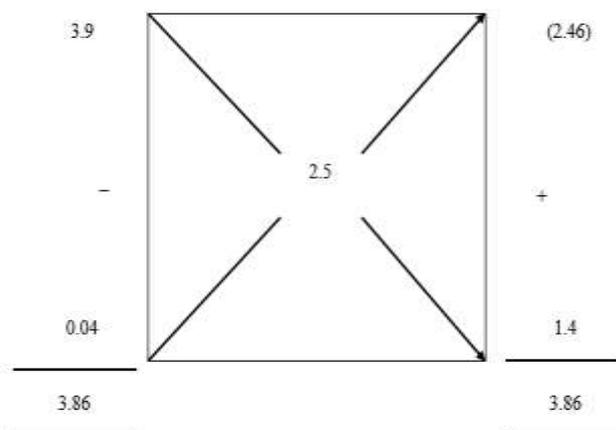
c) Milk standardisation is primarily performed to ensure that every customer gets desired milk fat content and consistency **True**

d) The alkaline phosphatase test is used to determine whether the pasteurisation has been adequate and whether there has been contamination after pasteurisation. **True**

e) During production of plain yoghurt it is recommended to use yoghurt starter culture and milk only? **True**

4. How much whole milk with 3.9% fat and skimmed milk with 0.04% fat content will you need to produce 2000 kg of standardized milk with 2.5% fat?

Answer:



- Proportion of the whole milk = $2.46/3.86$
- Amount of whole milk required = $(2.46/3.86)*2000 = 1274.6$ kg
- Proportion of skimmed milk = $1.4/3.86$
- Amount of skimmed milk required = $(1.4/3.86)*2000 = 725.4$ kg
or $2000 - 1274.6$

Practical assessment

DEAR DAIRY Ltd located in MUSANZE district processes fermented milk products such as IKIVUGUTO and yoghurts. Has a problem of producing poor quality of yoghurt but production manager found that it is not problem of raw milk quality due to all test conducted well at a reception. The root cause of this problem start from pasteurization to quality checking of final product.

Task: As a qualified technician in food processing, you are asked to solve this problem by performing pasteurization of milk, performing cooling and inoculation of milk, performing incubation of milk and checking quality parameters for the milk. For the first time you will use 50L of raw milk as an entry exam. Perform the task within eight (8) hours. All required resources are available at the working area.

Checklist

SN	Criteria	Indicator	Score	
			Yes	No
1	Milk is properly pasteurized	Quantity of milk is used		
		Milk is standardized		
		Milk is homogenized		
		Pasteurization is respected		
		Pasteurization conditions is respected		
		Alkaline phosphatase test is performed		
		Organoleptic test is performed		
2	Milk is properly cooled and inoculated	Inoculation temperature is respected		
		Ratio of starter culture is used		
		Addition of starter culture is done		
3	Yoghurt is well incubated	Incubation temperature is respected		
		Incubation time is respected		
4	Quality parameters are well checked	Hygiene is maintained		
		Sample is taken		
		Organoleptic test is done		
		pH test is done		
		pH of 4.5-4.6 is seen		
		Given time was respected		

END



Further information to the trainer

Chandan, R. C. (2011). Dairy ingredients for food processing: an overview. Dairy ingredients for food processing, 3-33.

Haque, A., Richardson, R. K., & Morris, E. R. (2001). Effect of fermentation temperature on the rheology of set and stirred yogurt. Food Hydrocolloids, 15(4-6), 593-602.

John A. Ayo, Paul L. H. Mc Sweeney (2013) "Kosikowski's Basic Dairy Chemistry" springer

Kumari, A., Kumar, P., Kumar, A., & Singh, A. (2020). Development and standardization of knowledge test on value addition of milk. Indian Journal of Extension Education, 56(4), 7-13.

Mortazavian, A. M., Ghorbanipour, S., Mohammadifar, M. A., & Mohammadi, M. (2011). Biochemical properties and viable probiotic population of yogurt at different bacterial inoculation rates and incubation temperatures. The Philippine Agricultural Scientist, 94(2), 111-116.

Pearson, R. E., & Freeman, A. E. (1972). Standardization of part and complete milk and milk fat production records. Journal of Dairy Science, 55(5), 581-588.

Ramesh C. Chandan, Arun Kilara, Nagendra (2008) P. Shah "Dairy Processing and Quality Assurance" Wiley Blackwell

Tamime, A. Y., Kalab, M., & Davies, G. (1991). The effect of processing temperatures on the microstructure and firmness of Labneh made from cow's milk by the traditional method or by ultrafiltration. Food Structure, 10(4), 8.

Tamime, R. K. Robinson (2009) "Milk Processing and Quality Management" Wiley-Blackwell

Learning Outcome 3: Store Fermented Milk



Indicative contents

3.1. Preparation of packaging material

3.2. Packaging of fermented milk products

3.3. Monitoring of storage conditions of fermented milk

Key Competencies for Learning Outcome 3: Store Fermented Milk

Knowledge	Skills	Attitudes
<ul style="list-style-type: none">• Description of types of packaging materials• Description of techniques of labelling• Description of storage techniques of fermented milk• Identification of storage conditions of fermented milk products• Differentiation of storage conditions of fermented milk products	<ul style="list-style-type: none">• Selecting and cleaning packaging materials• Filling and sealing fermented milk products• Labelling the fermented milk products• Applying cold room and refrigerator• Monitoring storage conditions of fermented milk	<ul style="list-style-type: none">• Being careful when selecting and cleaning packaging materials• Being attentive when filling and sealing of fermented milk products• Being careful when labelling the fermented milk products• Being careful when applying cold room and refrigerator• Being punctual when monitoring storage conditions of fermented milk



Duration: 10 hrs

Learning outcome 3 objectives:



By the end of the learning outcome, the trainees will be able to:

1. Identify properly the types of packaging materials used for IKIVUGUTO and yoghurt
2. Prepare properly packaging materials used for IKIVUGUTO and yoghurt
3. Package properly fermented milk products according to the packaging techniques
4. Perform properly labelling of fermented milk according to the labelling techniques
5. Describe correctly the storage conditions of fermented milk according to the type of product
6. Apply properly the storage techniques of fermented milk according to the storage conditions



Resources

Equipment	Tools	Materials
<ul style="list-style-type: none"> • Milk cans • Black board • Refrigerator • Freezer • PPEs • Packaging machine • Sealing machine • Labelling machine • Homogenizers • Incubator 	<ul style="list-style-type: none"> • Thermometer • Timer • Stirrer • Wooden spoon • Cooking pan • Electronic and • Mechanical balance • Jags 	<ul style="list-style-type: none"> • Gloves • Labels • Packaging materials • Scotch • Glue



Advance Preparation:

Before delivering this outcome, you are recommended to:

- Make sure that both classroom and workshop are available
- Avail materials, tools and equipment and make sure that they are in good working condition and verify if materials are not expired
- Prepare teaching aids and didactic materials (manuals/guides, task sheets, photos, audio-visuels, protocols.)



Indicative content 3.1: Preparation of packaging materials



Duration: 2 hrs



Theoretical Activity 3.1.1: Identification of types of packaging material



Notes to the trainer:

- Trainer use small groups to identify types of packaging materials
- The use of pictures or videos as didactic materials is required.



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to answer the following questions:
- While packaging IKIVUGUTO and yoghurt what are the packaging materials should you use?
 - What are the selection criteria of packaging material used for yoghurt and IKIVUGUTO?
- Step 2:** Monitor discussions in groups and ask trainees to write their findings on papers, flip chart, blackboard or white board.
- Step 3:** Asks trainees to discuss on the provided answers and choose the correct ones.
- Step 4:** Provide the expert view and clarify ideas by using didactic materials.
- Step 5:** Address any questions or concerns.
- Step 6:** Ask trainees to read the key reading 3.1.1. in trainee manual



Points to Remember

- Glass bottles, coated paper board containers and plastic bottles/cup are types of packaging materials used in IKIVUGUTO and yoghurt.



Practical Activity 3.1.2: Preparing packaging materials



Notes to the trainer

- The trainer is supposed to demonstrate how to prepare packaging materials
- For the effective delivery it is recommended to:
 - ✓ Avail packaging materials to be prepared
 - ✓ Avail workplace where packaging materials will be prepared



Key steps:

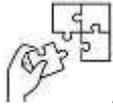
While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to prepare packaging materials for yoghurt and IKIVUGUTO products
- Step 2:** Explain the task and provide clear work instruction (Task, PPE, Time allocated)
- Step 3:** Demonstrate how to prepare packaging materials used in production of yoghurt and IKIVUGUTO. While demonstrating, explain the procedures.
- Step 4:** Ask trainees to prepare packaging materials used in production of yoghurt and IKIVUGUTO and monitor the procedures.
- Step 5:** Verify whether packaging materials used in production of yoghurt and IKIVUGUTO are well prepared, and provide feedback where necessary.
- Step 6:** Ask trainees to read key reading 3.1.2 in trainee manual
- Step 7:** Ask trainees to perform the task provided in application of learning 3.1



Points to Remember

- While selecting packaging materials follow the safety guidelines to prevent the accident and injury
- While cleaning the packaging remember to use hot water 40-70°C and detergent where necessary
- Sterilize the packaging materials using boiled water with oxonia 0.2%



Application of learning 3.1.

Ask learner to go in school workshop for fermented milk production to select and clean the packaging materials used in fermented milk production.

Checklist

SN	Criteria	Indicator	Score	
			Yes	No
1	Packaging materials are well selected and cleaned	Selection steps are followed		
		Selection criteria are considered		
		Cleaning steps are followed		



Indicative content 3.2: Packaging of fermented milk products



Duration: 6 hrs



Practical Activity 3.2.1: Packaging the fermented milk products



Notes to the trainer

- The trainer supposed to demonstrate how to package the fermented milk products
- For the effective delivery it is recommended to:
 - ✓ Avail fermented milk products to package
 - ✓ Avail workplace where fermented milk products will be packaged.



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to package IKIVUGUTO and yoghurt.
- Step 2:** Explain the task and provide clear work instruction (Task, PPE, Time allocated)
- Step 3:** Demonstrate how to package fermented milk products. While demonstrating, explain the procedures.
- Step 4:** Ask trainees to package fermented milk products and monitor the procedures.
- Step 5:** Verify whether fermented milk products are well packaged, and provide feedback where necessary.
- Step 6:** Ask trainees to read key reading 3.2.1 in trainee manual
- Step 7:** Ask trainees to perform the task provided in application of learning 3.2



Points to Remember

- While filling the fermented milk products remember to head space the package
- Hygiene is a must while you are filling IKIVUGUTO and yoghurt
- Seal properly the package to prevent cross contamination from air to the product



Practical Activity 3.2.2: Performing labelling of fermented milk products



Notes to the trainer

- The trainer supposed to demonstrate how to label the fermented milk products
- For the effective delivery it is recommended to:
 - ✓ Avail packaged fermented milk products to be labelled
 - ✓ Avail workplace where fermented milk products will be labelled



Key steps:

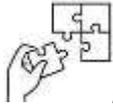
While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to perform labelling of IKIVUGUTO and yoghurt.
- Step 2:** Explain the task and provide clear work instruction (Task, PPE, Time allocated)
- Step 3:** Demonstrate how to perform labelling of IKIVUGUTO and yoghurt. While demonstrating, explain the procedures.
- Step 4:** Ask trainees to perform labelling of fermented milk products and monitor the procedures.
- Step 5:** Verify whether fermented milk products are well labelled, and provide feedback where necessary.
- Step 6:** Ask trainees to read key reading 3.2.2 in trainee manual
- Step 7:** Ask trainees to perform the task provided in application of learning 3.2



Points to Remember

- Before labelling check well to ensure if all required information are indicated on label



Application of learning 3.2.

Ask learner to go in school workshop for fermented milk production to fill, seal and label the fermented milk products.

Checklist

SN	Criteria	Indicator	Score	
			Yes	No
1	Yoghurt and IKIVUGUTO are well filled, sealed and labelled	Filling steps are followed		
		Sealing steps are followed		
		Labelling steps are followed		



Indicative content 3.3: Monitoring of storage conditions of fermented milk



Duration: 2 hrs



Theoretical Activity 3.3.1: Description of storage conditions of fermented milk products



Notes to the trainer:

- Trainer use small groups to describe storage conditions of fermented milk products
- The use of pictures or videos as didactic materials is required.



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to answer the following questions:
What are the storage conditions of IKIVUGUTO and yoghurt?
- Step 2:** Monitor discussions in groups and ask trainees to write their findings on papers, flip chart, blackboard or white board.
- Step 3:** Asks trainees to discuss on the provided answers and choose the correct ones.
- Step 4:** Provide the expert view and clarify ideas by using didactic materials.
- Step 5:** Address any questions or concerns.
- Step 6:** Ask trainees to read the key reading 3.3.1. in trainee manual



Points to Remember

- IKIVUGUTO can be stored in refrigerator at 4-6⁰c for 5-7 days and 2-3 days at room temperature
- Yoghurt can be kept in freezer at 0-degree F for 6 to 8 weeks but it just might lose taste or texture.
- Yoghurt is stored in cold room at 4-7°C for 30 days to 90 days.



Practical Activity 3.3.2: Applying storage techniques of fermented milk products



Notes to the trainer

- The trainer supposed to demonstrate how to apply storage techniques of fermented milk products
- For the effective delivery it is recommended to:
 - ✓ Avail fermented milk product to be stored
 - ✓ Avail workplace where fermented milk product will be stored



Key steps:

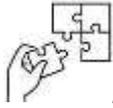
While delivering this activity, pass through the following steps:

- Step 1:** Introduce the activity and ask trainees to apply storage techniques of fermented milk products
- Step 2:** Explain the task and provide clear work instruction (Task, PPE, Time allocated)
- Step 3:** Demonstrate how to store fermented milk products. While demonstrating, explain the procedures.
- Step 4:** Ask trainees to store fermented milk products and monitor the procedures.
- Step 5:** Verify whether fermented milk products are well stored, and provide feedback where necessary.
- Step 6:** Ask trainees to read key reading 3.3.2 in trainee manual
- Step 7:** Ask trainees to perform the activity in application of learning 3.3



Points to Remember

- Cold room temperature ranging from 0°C to 10°C
- Remember that if the temperature of cold room and refrigerator reaches to 0°C will automatically switch off itself
- Refrigeration temperature is between 0°C and 4°C



Application of learning 3.3.

Ask learner to identify and visit any dairy nearby your community to observe how they apply cold room and refrigerator used in storing fermented milk products. Produce a visit report.

Checklist

SN	Criteria	Indicator	Score	
			Yes	No
1	Cold room and refrigerator are properly applied	Dairy is identified		
		Steps of applying cold room is observed		
		Steps of applying refrigerator is observed		
		A visit report is provided		



Written assessment

1. Fill the sentence below with given appropriate term (packaging, packaging material, filling, sealing, labelling)

a)is the process of enclosing processed product in packaging material to protect it from any damage, contamination, spoilage, pest attacks and tempering during transport, storage and retail sale.

Answer: Packaging

b)means any item or material which is intended to contain processed or semi-processed food in order to protect it.

Answer: Packaging material

c)is a process of pouring product into packaging material.

Answer: Filling

d) is the process of tight and perfect closure of packaging material against gas or any other product in or out?

Answer: Sealing

2. Read careful the following statement and choose the correct answer:

i. The primary purpose of packaging fermented milk products is:

- a) To add flavour to the product
- b) To increase the cost of production
- c) To protect the product from damage and contamination**
- d) To reduce the shelf life of the product

ii. The following are criteria to consider when selecting packaging material for fermented milk products except

- a) Resistance to UV light
- b) High oxygen barrier properties
- c) Not imparting a strong flavour to the product
- d) Mechanical properties**

iii. The purpose of sterilizing packaging materials before filling yoghurt or IKIVUGUTO is:

- a) To reduce the shelf life
- b) To make the packaging materials easier to handle
- c) To kill and eliminate microorganisms**
- d) To add flavour to the product

iv. Labelling technique involves printing all information directly on the packaging is:

- a) Applied labelling
- b) Direct labelling**

- c) Transparent labelling
- d) Indirect labelling

3. Outline five labelling information that should be indicated on label of yoghurt

Answer:

- Product name: the product should be named for its identification
- Quantity of product / Net quantity: the quantity of product to the label is very crucial as it even justifies its price
- List of ingredients in descending order
- Company location/ producer location
- Shelf-life information: including production date, expiration date or best before date.
- Company/ produce address: company address plays a critical function as it is helpful in knowing a company and getting different information about it that will attract many customers.
- Batch number: it is a number given to food products by a food processing company which helps in product traceability.
- Allergen's content (if any): the food manufacturer has to clearly identify and explain the allergens content if they are present for helping clients to whom they are allergic.
- Nutritional information
- Instruction of use: instruction about the product utilization or usage is very important to achieve its effectiveness.
- Storage conditions: identification of product storage conditions is very important to contribute to product quality and safety
- Lot number or batch number, Bar code.
- Universal product card/barcode.
- Advertising: sealed for freshness, aroma
- Direction for use.
- Nutritional information.

4. Storage techniques for IKIVUGUTO and yoghurt are cold room and refrigeration storage. Differentiate these two (2) techniques.

Answer:

- **Cold Room:** Cold rooms typically have temperatures ranging from 0°C to 10°C (32°F to 50°F). While this is colder than room temperature, it may not be as cool as a refrigerator.
- **Refrigerator:** Refrigerators should maintain temperatures between 0°C and 4°C (32°F to 39°F). This temperature range slows down bacterial growth and helps preserve the quality of fermented milk.

Practical assessment

AYERA DAIRY Ltd located in MUSANZE district processes fermented milk products such as IKIVUGUTO and yogurts. This dairy has problem of the product that get spoiled quickly due to the packaging and storage conditions provided by the dairy workers. Dairy manager requests you as skilled trainee in fermented milk making to solve that problem by performing the following tasks:

Task 1: Prepare packaging materials for IKIVUGUTO and yogurt

Task 2: Fill and seal IKIVUGUTO and yoghurt

Task 3: Perform labelling of IKIVUGUTO and yoghurt

Task 4: Store IKIVUGUTO and yoghurt

N.B:

- ❖ You are requested to use plastic bottles 500ml for each bottle in yogurt
- ❖ Use plastic cans of 2L for each can in IKIVUGUTO
- ❖ Quantity of IKIVUGUTO to use is 10L and 10L of yoghurt
- ❖ All resources needed are available in the work area
- ❖ Time to accomplish the activity is 5hours

Checklist

SN	Criteria	Indicator	Score	
			Yes	No
1	Packaging materials are properly prepared	Packaging materials for IKIVUGUTO are selected		
		Packaging materials for yoghurt are selected		
		Packaging materials for IKIVUGUTO are sterilized		
		Packaging materials for yoghurt are sterilized		
2	IKIVUGUTO and yoghurt is accurately filled and sealed	Filling of IKIVUGUTO is done		
		Filling of yoghurt is done		
		Quantity of IKIVUGUTO and yoghurt is respected		
		Sealing of IKIVUGUTO is done		
		Sealing of yoghurt is done		
3	IKIVUGUTO and yoghurt is properly labelled	Label information is indicated		
		Labelling of IKIVUGUTO is done		
		Labelling of yoghurt is done		
		Time allocated is respected		

4	IKIVUGUTO and yoghurt is properly stored	Cold room or refrigerator is used		
		Storage temperature is respected		
		Storage time is respected		

END



Further information to the trainer

Brody, A. L. (2006). Fermented dairy packaging materials. *Manufacturing yogurt and fermented milks*, 129-150.

MacBean, R. D. (2009). Packaging and the shelf life of yogurt. *Food packaging and shelf life*, 143-156.

Nzabuheraheza, F., & Nyiramugwera, A. N. (2016). Microbiological analysis of traditionally fermented milk sold in Kinigi Sector of Musanze District in Rwanda. *African Journal of Food, Agriculture, Nutrition and Development*, 16(2), 10841-10852.

Tamime, A. Y. (2002). Fermented milks: a historical food with modern applications—a review. *European journal of clinical nutrition*, 56(4), S2-S15.



October, 2024