



RQF LEVEL 4



FOPPK403

FOOD PROCESSING

Tomato Paste and Ketchup Making

TRAINER'S MANUAL

October, 2024



TOMATO PASTE AND KETCHUP MAKING



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TABLE OF CONTENT

AUTHOR'S NOTE PAGE (COPYRIGHT)-----	iii
ACKNOWLEDGEMENTS-----	iv
TABLE OF CONTENT -----	vii
ACRONYMS-----	ix
INTRODUCTION -----	1
MODULE CODE AND TITLE: FOPPK403 TOMATO PASTE AND KETCHUP MAKING -----	2
Learning Outcome 1: Prepare Workplace and Ingredients-----	3
Key Competencies for Learning Outcome 1: Prepare Workplace and Ingredients -----	4
Indicative content 1.1: Selection of tools and equipment used in tomato paste and ketchup making-----	7
Indicative content 1.2: Selection of materials used in tomato paste and ketchup making	11
Indicative content 1.3: Arrangement of workplace -----	14
Learning Outcome 1 end Assessment -----	21
Further information to the trainer-----	28
Learning Outcome 2: Make Tomato Paste. -----	29
Key Competencies for Learning Outcome 2: Make tomato paste. -----	30
Indicative content 2.1: Extraction of tomato pulp.-----	33
Indicative content 2.2: Cooking and concentrating tomato pulp -----	37
Indicative content 2.3: Cooling of tomato paste.-----	40
Indicative content 2.4. Checking the quality of tomato paste-----	42
Learning Outcome 2 end Assessment-----	44
Further information to the trainer-----	47
Learning Outcome 3: Make tomato ketchup-----	48
Key Competencies for Learning Outcome 3 : Make tomato ketchup-----	49
Indicative content 3.1: Adding Ingredients -----	52
Indicative content 3.2: Cooking and concentrating tomato pulp -----	55
Indicative content 3.3: Cooling of tomato ketchup -----	58
Learning Outcome 3 end Assessment-----	62
Further information to the trainer-----	65

Learning Outcome 4: Package The Product-----	66
Key Competencies for Learning Outcome 4: Package the Product-----	67
Indicative content 4.1: Filling of tomato paste and ketchup into packaging materials -----	69
Indicative content 4.2: Label tomato paste and ketchup -----	72
Indicative content 4.3: Storing of tomato paste and ketchup -----	74
Learning Outcome 4 end Assessment-----	76
Further information to the trainer-----	78

ACRONYMS

%: Percentage

° C: Degree Celsius

°F: Degree Fahrenheit

AGR: Agriculture

ATP: Adenosine triphosphate

CBT/A: Competence-Based Training/Assessment

CCP: Critical Control Point

CIP: Cleaning in Place

CFU: Colony Forming Unit

COP: Cleaning Out of Place

FOP: Food Processing

HTST: High-Temperature Short Time

IC: Indicative content

KOICA: Korean International Cooperation Agency

LED: Light-Emitting Diode

MINAGRI: Ministry of Agriculture and Animal Resources of Rwanda

pH: Potential of Hydrogen

PPE: Personal Protective Equipment

PSF: Private Sector Federation

RP: Rwanda Polytechnic

RQF: Rwanda Qualification Framework

RTB: Rwanda TVET Board

TQUM Project: TVET Quality Management Project

TQUM: TVET Quality Management

TSS: Technical Secondary School

TVET: Technical and Vocational Education and Training

WFP: World Food Program

INTRODUCTION

This trainer's manual includes all the methodologies required to effectively deliver the module titled **"Tomato Paste and Ketchup making."** 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 labor 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: FOPPK403 TOMATO PASTE AND KETCHUP MAKING

Learning Outcome 1: Prepare workplace and ingredients

Learning Outcome 2: Make tomato paste

Learning Outcome 3: Make tomato ketchup

Learning Outcome 4: Package the product

Learning Outcome 1: Prepare Workplace and Ingredients



Indicative contents

1.1 Selection of tools and equipment

1.2 Selection of materials used in tomato paste and ketchup

1.3 Arrangement of workplace

1.4 Preparing ingredients used in tomato paste and ketchup making

Key Competencies for Learning Outcome 1: Prepare Workplace and Ingredients

Knowledge	Skills	Attitudes
● Description of tools and equipment. ● Description of materials used in tomato paste and ketchup	● Selecting tools and equipment for making tomato paste and ketchup. ● Selecting materials used in tomato paste and ketchup ● Preparing cleaning products ● Cleaning the workplace ● Arranging the workplace, tools, and equipment ● Sorting raw materials ● Washing tomatoes ● Blanching tomatoes	● Being careful when selecting materials ● Being responsible when handling tools and equipment ● Paying attention while using sharp tools



Duration: 10 hrs

Learning Outcome 1 objectives:



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

1. Describe properly tools and equipment according to their intended use.
2. Describe correctly the materials used in tomato paste and ketchup.
3. Select adequately materials, tools, and equipment according to selection criteria.
4. Prepare correctly cleaning products according to cleaning procedures
5. Clean effectively workplace, tools, and equipment following the cleaning methods and techniques.
6. Arrange perfectly the workplace referring to the process flow chart
7. Sort appropriately tomatoes according to the sorting criteria
8. Wash thoroughly tomatoes according to tomato washing techniques
9. Blanch perfectly tomatoes according to tomato pulp quality.



Resources

Equipment	Tools	Materials
● Gas stove ● Steamer ● Washing machine ● Conveyer belt ● Blancher ● Slicer ● Tomato pulper ● Strainer ● Crusher ● Blender ● Evaporator ● Cooling tank ● Homogenizer ● Packaging machine	● Stiller/Agitator ● Bloom ● pH Meter ● Refractometer ● Basins ● Basket ● Knives ● Working tables ● Electronic balance ● PPE ● Plastic boxes ● Graduated jugs ● Squeegee ● Mop ● White towel ● Wooden brush ● Cooking pan ● Thermometer	● Fresh tomato ● Table salt ● Red chili pepper ● Sugar ● Onions ● Garlic ● Potable water ● Red pepper ● Vinegar ● Xanthan gum ● Sodium benzoate ● Citric acid ● Potassium sorbate ● Flavouring agents ● Disinfectant ● Single use gloves ● Detergents ● Packaging materials.

	● Sieve ● Spoons ● Graduated cylinder ● Funnel ● Plates.	
 Advance Preparation: Before delivering this learning outcome, you are recommended to: ● Avail materials, tools and equipment for tomato paste and ketchup making in the storeroom. ● Have didactic materials required to deliver this learning outcome. ● Make sure there are tomatoes for tomato paste and ketchup making.		



Indicative content 1.1: Selection of tools and equipment used in tomato paste and ketchup making



Duration: 3 hrs



Theoretical Activity 1.1.1: Description of tools and equipment for tomato paste and ketchup making



Notes to the trainer:

- Trainer may use small groups to describe tools and equipment used in tomato paste and ketchup
 - Avail some drawings, and pictures showing tools and equipment for tomato paste making to be used as didactic materials



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the session, and ask trainee to answer the following questions:

- i. What could be tools and equipment utilized for making tomato paste and ketchup?
- ii. What could be the characteristics of those tools and equipment?
- iii. What safety precautions should be taken when operating those tools and equipment?

Step 2: Ask trainees to write the findings on paper, flip charts, blackboard, or whiteboards

Step 3: Facilitate trainees to present their findings

Step 4: Provide an expert view and clarify ideas using didactic materials

Step 5: Address any questions or concerns

Step 6: Ask trainees to read the key reading 1.1.1 in the trainee manual



Points to Remember

- In making tomato paste and ketchup tools including pans, cutting board, refractometer, and pH meter are very important.
- In making tomato paste and ketchup don't miss equipment such as blancher, blender, tomato crusher, and vacuum evaporator



Practical Activity 1.1.2: Selecting tools and equipment for tomato paste and ketchup making

Notes to the trainer

Trainer may:

- Avail tools and equipment required for tomato paste and ketchup making.
- Facilitate every trainee in selecting tools and equipment used in tomato paste and ketchup making.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go to the tomato paste and ketchup-making workshop to select the right tools and equipment to be used in making tomato paste and ketchup.

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

Step 3: Demonstrate how to select tools and equipment for tomato paste and ketchup making. While demonstrating, explain clearly the procedures for selecting tools and equipment.

Step 4: Ask trainees to select tools and equipment for tomato paste and ketchup making and monitor the activity.

Step 5: Verify whether tools and equipment are properly selected and provide feedback where necessary.

Step 6: Ask trainees to read key reading 1.1.2 in the trainee manual

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



Points to Remember

- For safety issues, always wear PPE before selecting tools and equipment for tomato paste and ketchup making.
- Make sure to respect the selection criteria of tools and equipment used in tomato paste and ketchup making.



Practical Activity 1.1.3: Adjusting tools and equipment



Notes to the trainer

- Trainer may ensure that the workshop is available
- Ensure that tools and equipment to be adjusted are available.
- Avail procedures for adjustments



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go to the tomato paste and ketchup-making workshop to adjust the tools and equipment required in tomato paste and ketchup making.

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

Step 3: Demonstrate how to adjust tools and equipment for tomato paste and ketchup making. While demonstrating, explain clearly the procedures for adjusting those tools and equipment.

Step 4: Ask trainees to adjust tools and equipment for tomato paste and ketchup making and monitor trainees' activities.

Step 5: Verify if tools and equipment are correctly adjusted and provide feedback where necessary

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

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



Points to Remember

- Unplug electrical equipment when not in use.
- Beware to follow the manufacturer's instructions when adjusting tools or equipment.



Application of learning 1.1.

In the school's tomato paste and ketchup-making workshop, request each trainee to select and adjust tools and equipment for tomato paste and ketchup-making.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Tools and equipment are appropriately selected	1.1 Cleaning tools and equipment are selected		
		1.2 Tomato paste and ketchup-making tools and equipment are selected		
2	Tools and equipment are adequately adjusted	2.1 pH meter is adjusted		
		2.2 Balance is adjusted		
		2.3 Filling machine is adjusted		
3	The activity report is well done	3.1 Activity report is availed		
		3.2 Key competencies gained are described		
		3.3 Recommendations are mentioned		



Indicative content 1.2: Selection of materials used in tomato paste and ketchup making



Duration: 2 hrs



Theoretical Activity 1.2.1: Description of materials needed in tomato paste and ketchup making



Notes to the trainer:

Trainer may:

- Use small groups to describe materials needed in tomato paste and ketchup
- Avail some drawings and pictures related to materials needed in tomato paste and ketchup making as didactic materials



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. What could be the materials in tomato paste and ketchup making?
- ii. What can be the safety precautions when using those materials?

Step 2: Ask trainees to write the findings on paper, flip charts, blackboard, or whiteboards

Step 3: Facilitate trainees to present their findings

Step 4: Provide an expert view and clarify ideas using didactic materials

Step 5: Address any questions or concerns

Step 6: Ask trainees to read the key reading 1.2.1 in the trainee manual



Points to Remember

- Water, acidic cleaners, alkaline cleaners, neutral cleaners and degreaser are the common cleaning products for tomato paste and ketchup workplace, tools and equipment
- For tomato paste and ketchup making, tomatoes should be sweet and acidic to provide a high quality product.
- Preservatives are most important for longer shelf life only if aseptic packaging is not used.
- Seasonings may differ according to customers' preferences.
- Good packaging material for tomato paste and ketchup must fulfil the requirements including inert to the product, moisture and gas barrier and provided with tamper-proof seals and closures.



Practical Activity 1.2.2: Selecting materials used in tomato paste and ketchup making

Notes to the trainer

Trainer may:

- Facilitate every trainee in selecting materials for tomato paste and ketchup making
- Avail materials for tomato paste and ketchup making
- Avail some drawings, pictures to be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go to the tomato paste and ketchup making workshop to select materials required in tomato paste and ketchup making.

Step 2: Explain the task and provide clear working instructions (PPE, Time allocated)

Step 3: Demonstrate how to select materials for tomato paste and ketchup making. While demonstrating, explain clearly the procedures for selecting those materials.

Step 4: Ask trainees to select materials for tomato paste and ketchup making and monitor trainees' activities.

Step 5: Verify whether materials for tomato paste and ketchup making were correctly selected and provide feedback where necessary.

Step 6: Ask trainees to read key reading 1.2.2 in trainee manual

Step 7: Ask trainees to perform the task provided in application of learning 1.2



Points to Remember

- Always wear PPE before handling cleaning products
- Good quality raw materials will give good quality tomato paste and ketchup, therefore select tomatoes thoroughly.
- Choose a packaging material that protects the quality of tomato paste, and ketchup.



Application of learning 1.2.

In school's tomato paste and ketchup making workshop, request each trainee to select materials for tomato paste and ketchup making.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Materials are appropriately selected	1.1 Cleaning materials are selected		
		1.2 Tomatoes are selected		
		1.3 Preservatives are selected		
		1.4 Seasonings are selected		
		1.5 Packaging materials are selected		
2	Activity report is well done	2.1 Activity report is available		
		2.2 Key competencies gained are described		
		2.3 Recommendations are mentioned		



Indicative content 1.3: Arrangement of workplace



Duration: 2 hrs



Practical Activity 1.3.1: Cleaning workplace, tools and equipment for tomato paste and ketchup making



Notes to the trainer

Trainer may:

- Facilitate each trainee to clean the workplace, tools, and equipment for tomato paste and ketchup making
- Avail all materials, tools, and equipment required to perform this task.
- Avail cleaning protocols



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go to the tomato paste and ketchup making workshop to clean the workplace, tools, and equipment for tomato paste and ketchup making.

Step 2: Explain the task and provide clear working instructions (PPE, Time allocated)

Step 3: Demonstrate how to clean the workplace, tools, and equipment for tomato paste and ketchup making. While demonstrating, explain clearly cleaning methods and the procedures for cleaning the workplace, tools, and equipment.

Step 4: Ask trainees to clean tools, equipment and work place for tomato paste and ketchup making and monitor the activity.

Step 5: Verify whether the workplace, tools, and equipment are properly cleaned and provide feedback on each trainee's work

Step 6: Ask trainees to read key reading 1.3.1 in the trainee manual

Step 7: Ask trainees to perform the task provided in the application of Learning 1.3



Points to Remember

- For safety issue, before cleaning workplace tools and equipment wear, full PPE
- While preparing cleaning products, never mix bleach and ammonia because this can produce highly toxic chloramine gas, which can cause serious health problems.
- When diluting cleaning products, it is highly recommended to respect the dosages.
- The most common methods used to check the workplace cleanliness include; visual inspection, swab testing and using phenolphthalein.



Practical Activity 1.3.2: Arrangement of the workplace for tomato paste and ketchup making

Notes to the trainer

Trainer may:

- Avail a disorganized tomato paste and ketchup making workshop.
- Ask each trainee to arrange the workplace, tools, and equipment.
- The use of pictures/drawings showing the process flow chart of a tomato paste and ketchup workplace is helpful.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go to the tomato paste and ketchup workshop to arrange the workplace.

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

Step 3: Demonstrate how to arrange the workplace. While demonstrating, explain clearly the process flow chart and steps to be followed to arrange workplace.

Step 4: Ask trainees to arrange workplace for tomato paste and ketchup making and monitor the activity.

Step 5: Verify if the workplace, tools, and equipment are well arranged, and provide feedback on each trainee's work.

Step 6: Ask trainees to read key reading 1.3.2 in the trainee manual

Step 7: Ask trainees to perform the task provided in the application of Learning 1.3



Points to Remember

- Before arranging the workplace for honey processing, bear in mind the tomato paste and ketchup making flow chart.



Application of learning 1.3.

In the school's tomato paste and ketchup making workshop, request each trainee to clean and arrange the workplace tools and equipment.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Workplace, tools and equipment are properly cleaned	1.1 Cleaning products are selected		
		1.2 Cleaning tools and equipment are selected		
		1.3 Cleaning products are prepared		
		1.4 Tools and equipment are cleaned		
		1.5 Workplace is cleaned		
		1.6 Cleanliness is checked		
2	Workplace, tools and equipment are well arranged	2.1 Process flow chart is respected		
3	Activity report is well done	3.1 Activity report is availed		
		3.2 Key competencies gained are described		
		3.3 Recommendations are mentioned		



Indicative content 1.4: Preparing ingredients for tomato paste and ketchup



Duration: 3 hrs



Practical Activity 1.4.1: Sorting tomatoes



Notes to the trainer

Trainer may:

- Avail fresh tomatoes.
- Request each trainee to sort tomatoes for tomato paste and ketchup making.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go to the tomato paste and ketchup making workshop to sort tomatoes for tomato paste and ketchup making.

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

Step 3: Demonstrate how to sort tomatoes for tomato paste and ketchup making. While demonstrating, explain clearly the sorting criteria for tomatoes.

Step 4: Ask trainees to do the task individually and monitor trainees' activities.

Step 5: Verify whether tomatoes are adequately sorted, and provide feedback on each trainee 'work.

Step 6: Ask trainees to read key reading 1.4.1 in trainee manual

Step 7: Ask trainees to perform the task provided in application of learning 1.4



Points to Remember

- Before sorting raw material bear in your mind the sorting criteria including well ripen, free of diseases, mature, clean and free from spoilage.



Practical Activity 1.4.2: Washing tomatoes for tomato paste and ketchup making



Notes to the trainer

Trainer may:

- Avail fresh tomatoes.
- Request each trainee to wash tomatoes for tomato paste and ketchup making.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go to the tomato paste and ketchup making workshop to wash tomatoes for tomato paste and ketchup making.

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

Step 3: Demonstrate how to wash tomatoes for tomato paste and ketchup making. While demonstrating, explain the washing methods for tomatoes.

Step 4: Ask trainees to sort ingredient for tomatoes paste and ketchup then monitor trainees' activities.

Step 5: Verify if tomatoes are properly washed, and provide feedback on each trainee 'work.

Step 6: Ask trainees to read key reading 1.4.2 in trainee manual

Step 7: Ask trainees to perform the task provided in application of learning 1.4



Points to Remember

-
- It is mandatory to wash tomatoes before making tomato paste and ketchup to prevent food borne illness.
- Washing method can be applied based on the quantity of tomatoes to wash.



Practical Activity 1.4.3: Blanching tomatoes



Notes to the trainer

Trainer may:

- Avail tomatoes and icy water.
- Request every trainee to perform tomato blanching.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go to the tomato paste and ketchup making workshop to blanch tomatoes.

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

Step 3: Demonstrate how to blanch tomatoes. While demonstrating, explain the conditions and benefits of blanching tomatoes before making tomato paste and ketchup.

Step 4: Ask trainees to do the task individually and monitor trainees' activities.

Step 5: Verify if tomatoes are properly blanched and provide feedback on each trainee's work.

Step 6: Ask trainees to read key reading 1.4.2 in the trainee manual

Step 7: Ask trainees to perform the task provided in the application of learning 1.4



Points to Remember

- During tomato blanching, it is recommended to follow tomato blanching conditions to get good quality tomato pulp.
- It is strictly recommended to wear PPE to avoid being burnt from boiling water.



Application of learning 1.4.

In the school's tomato paste and ketchup making workshop, request each trainee to sort, wash, and blanch tomatoes for tomato paste and ketchup making.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Tomatoes are adequately sorted.	1.1 Sorting tools are selected		
		1.2 Sorting criteria are respected		
2	Tomatoes are thoroughly washed	2.1 Washing tools and equipment are selected		
		2.2 Washing techniques are applied		
3	Tomatoes are correctly blanched	3.1 Temperature is respected		
		3.2 Time is respected		
		3.3 Icy water is used		
4	Activity report is well done	4.1 Activity report is available		
		4.2 Key competencies gained are described		
		4.3 Recommendations are mentioned		



Learning Outcome 1 end Assessment

Theoretical assessment

1. Match the following tools and equipment with their descriptions by writing the letter with the corresponding digit in the provided space.

Answer	Description	Tool/equipment
1-D	1) It has a prism made of a material with a high refractive index, such as glass or sapphire, a Light source to illuminates the sample, an eye piece and a graduated scale	A. Blender
2-A	2) It has a motor that powers the blades, allowing them to spin at high speeds, a container to holds the ingredients and sharp blades designed to cut and chop ingredients.	B. Thermometer
3-E	3) It has a feeding hopper where the whole tomatoes are loaded. It has a crushing mechanism through which mechanical rollers, blades, or a combination of both crushes tomatoes. It also has a sieve or screen that separates the pulp and juice from the seeds and skins. Lastly, separated pulp and juice are collected in separate containers.	C. vacuum evaporator
4-B	4) It has a probe that is inserted into the food to measure its temperature, a display to shows the temperature reading.	D. Refractometer
5-F	5) It has tank or vat where the boiling water is contained. It also has a heating element that heats the water to boiling temperature. Finally, an Ice bath filled to immediately cool the blanched tomatoes.	E. Tomato pulper
		F. Blancher

2. Circle the letter corresponding to the answer.

The following are selection criteria of tools and equipment for tomato paste and ketchup except.

- Working conditions

- b. Availability of tools and equipment
- c. Cost
- d. Responsibility
- e. Efficiency
- f. Durability

Answer: d. Responsibility

1. The following are the steps for adjusting a weighing balance. Logically rearrange them.
 1. Make sure the balance is levelled.
 2. Adjust the sensitivity
 3. Calibrate the balance.
 4. Zero the balance.

Answer:

- 1. Make sure the balance is levelled.**
- 2. Zero the balance.**
- 3. Adjust the sensitivity of the balance**
- 4. Calibrate the balance.**

4. Fill in the blank space with the following terms related to cleaning products used in tomato paste and ketchup making workplace (**acidic cleaner, water, alkaline cleaner, neutral cleaner, and degreaser**).

- a. is a fundamental cleaning agent used for rinsing equipment and surfaces. It helps remove food particles, grease, and other contaminants.
- b. contain strong bases like sodium hydroxide or potassium hydroxide. Bleach (pH 12) and ammonia (pH 11) are common alkaline cleaning agents.
- c. have a dissolving action on grease and similar dirt. The solvent-containing degreaser may have an alkaline washing agent added to a solvent to promote further degreasing.
- d. agents are mainly used for removal of inorganic deposits like scaling. The active ingredients are normally strong mineral acids and chelants.
- e.agents are pH-neutral and based on non-ionic surfactants that disperse different types of dirt.

Answer:

- a. Water**
- b. Alkaline cleaner**
- c. Degreaser**

- d. Acidic cleaner
- e. Neutral cleaner

5. Read the following statements and answer **True** if the statement is correct and **False** if it is wrong.

- a. Tomatoes with low sugar content are preferred for tomato paste and ketchup to ensure a sweet and tangy flavor.

Answer: False

- b. Sodium benzoate is used to adjust the acidity level and preserve the product.

Answer: False

- c. Salt is used to enhance flavour and acts as a preservative in tomato paste and ketchup making.

Answer: True

- d. Packaging material shall preclude contamination with or proliferation of microorganisms in the products during storage and transport.

Answer: True

- e. Tomatoes with high-water content yield a more concentrated tomato paste or ketchup.

Answer: False

6. Read the following statements related to tomato blanching and answer by **true** if the statement is correct or **false** if it is wrong.

- a. Blanching tomatoes is the process of boiling them briefly and then plunging them into hot water.

Answer: False

- b. Blanching helps to loosen the skin, making it easier to remove, and also preserves the bright color of the tomatoes.

Answer: True

- c. After blanching, tomatoes should be immediately plunged into an ice bath to stop the cooking process and preserve the bright color.

Answer: True

- d. Tomatoes should be blanched for 1-2 seconds.

Answer: False

- e. When blanching tomatoes, overripe and ripe tomatoes may blanch as well.

Answer: False

7. Circle the letter corresponding to the answer.

The following are the selection criteria of ingredients for tomato paste and ketchup except:

- a. Shape
- b. Size
- c. Maturity
- d. Clarity
- e. Defects including colour disorders, growth cracks, sunscald, and early blight.
- f. Ripening
- g. Free of diseases

Answer: d. Clarity

8. The table below indicating the tests to check the cleanliness effectively match the explanations with their tests by simply writing the digit with the corresponding letter in the provided space.

Answer	Explanation	Cleanliness test
1-E	1) This involves using a pH meter to measure the pH of surfaces. A pH of 7 is neutral, while a pH below 7 is acidic and a pH above 7 is alkaline. Acidic and alkaline surfaces can be harmful to people and can also corrode equipment.	A) Swab test
2-C	2) This involves looking for visible dirt, dust, and debris. It is important to look carefully in all areas of the workplace, including floors, walls and equipment	B) Phenolphthalein test
3-B	3) This involves using a pH indicator solution to test for the presence of alkaline residue. This indicator turns pink when it comes into contact with alkaline residue.	C) Visual test
4-A	4) This involves using a swab to collect samples from surfaces. The samples can then be tested for bacteria, molds, and other contaminants.	D) Methylene blue test
		E) pH test

9. The following steps are for tomato ketchup making. Logically rearrange them.

- a. Receiving and sorting tomatoes
- b. Packaging and storage
- c. Cooking
- d. Concentration
- e. Blending
- f. Washing
- g. Crushing and pulping
- h. Filling
- i. Pasteurization
- j. Filtering

Answer:

- a. Receiving and sorting
- b. Washing
- c. Crushing and pulping
- d. Concentration
- e. Blending
- f. Cooking
- g. Filtering
- h. Filling
- i. Pasteurization
- j. Packaging and storage

Practical assessment

Your school has selected to host a meeting of different partners in education in your district.

Asks each trainee to perform the following tasks:

1. To select tools and equipment for tomato paste and ketchup-making
2. To clean the workplace, tools, and equipment for tomato paste and ketchup making
3. To arrange the workplace, tools, and materials for tomato paste and ketchup making
4. To select materials for tomato paste and ketchup-making
5. To blanch tomatoes for tomato paste and ketchup.

The task should be completed within 4 hours.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Materials, tools, and equipment are well selected.	1.1 Tools and equipment are selected		
		1.2 Packaging materials are selected		
		1.3 Cleaning products are selected		
		1.4 Ingredients are selected		
2	The workplace is correctly arranged	2.1 Workplace is cleaned		
		2.2 Tools and equipment are cleaned		
		2.3 Tools and equipment are arranged		
3	Ingredients are accurately prepared	3.1 Tomatoes are sorted		
		3.2 Tomatoes are washed		
		3.3 Tomatoes are 2 washed		
4	The activity report is well done	4.1 The activity report is availed		
		4.2 Key competencies gained are described		
		4.3 Recommendations are mentioned		

END



Further information to the trainer

Abdulmalik I., Amonye, M., Ambali, A., Umeanuka, P. and Mahdi, M. (2014): Appropriate Technology for Tomato Powder Production. Volume 3, Issue 8. Nigeria: International Journal of Engineering Inventions

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Fenco (2014): Tomato Paste Processing. www.fenco.it/eng/tomato-paste-processing.asp Accessed 24/09/2014. Fenco Food Machinery

Indian Standard IS 3882:1966 Reaffirmed 2001, Tomato ketchup

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SSP (2014): Tomato Processing Plant, Tomato Ketchup Plant, Tomato Processing Machine, Tomato Ketchup Machine. India: SSP PVT LIMITED <http://www.sspindia.com/tomatoprocessing-plant.html> (Accessed, 24/11/2014)

Learning Outcome 2: Make Tomato Paste.



Indicative contents

- 2.1 Extraction of tomato pulp**
- 2.2 Cooking and concentrating tomato pulp**
- 2.3 Cooling of tomato paste**
- 2.4 Checking quality of tomato paste**

Key Competencies for Learning Outcome 2: Make tomato paste.

Knowledge	Skills	Attitudes
● Explanation of the purpose of crushing tomatoes ● Differentiation of sedimentation from filtration ● Description of tomato paste quality	● Crushing tomatoes ● Separating tomato pulp components ● Checking the quality of tomato pulp ● Cooking for concentrating tomato pulp ● Adding ingredients ● Cooling tomato paste ● Checking the quality of tomato paste	● Paying attention while extracting tomatoes. ● Being careful when cooking tomato pulp. ● Being accurate when measuring ingredients ● Being responsible when measuring ingredients



Duration: 20 hrs

Learning outcome 2 objectives:



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

1. Explain clearly the purpose of crushing tomatoes according to crushing methods.
2. Crush adequately tomatoes for tomato paste making.
3. Differentiate clearly sedimentation from filtration both methods used in tomato paste making
4. Separate effectively tomato components according to tomato pulp quality specifications.
5. Check properly the quality of tomato pulp as per tomato pulp quality requirements.
6. Cook properly tomato pulp referring to tomato pulp cooking techniques.
7. Add carefully ingredients in tomato pulp according to tomato paste quality specifications.
8. Cool adequately tomato paste referring to tomato paste cooling conditions.
9. Describe correctly tomato paste quality referring to tomato paste quality specifications.
10. Check properly the quality of tomato paste as per tomato paste quality specifications.



Resources

Equipment	Tools	Materials
• Gas stove • Steamer • Slicer • Blancher • Tomato pulper • Crusher • Strainer • Blender, • Evaporator, • Cooling tank, • Mixing tanks • Containers • PPE	• pH Meter • Refractometer • Stiller/Agitator • Stainless working tables • Electronic balance • Plastic boxes • Graduated Jugs • Graduated cylinder • Cooking pans • Gas lighter • Thermometer • Sieve	• Fresh tomato • Table salt • Vinegar • Sodium Benzoate • Citric Acid • Potassium Sorbate • Disinfectant • Detergents • Single use gloves • Packaging materials

**Advance Preparation:**

Before delivering this learning outcome, you are recommended to:

- Ensure the workshop is well prepared and organized
- Avail fresh tomatoes and other ingredients for tomato paste making.
- Avail didactic materials required to deliver this learning outcome



Indicative content 2.1: Extraction of tomato pulp.



Duration: 5 hrs



Practical Activity 2.1.1: Crushing tomatoes



Notes to the trainer

The trainer may:

- Facilitate every trainee in tomato crushing.
- Avail tools and equipment used in tomato crushing.
- Avail videos related to tomato crushing to be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go to the tomato paste and ketchup making workshop to crush tomatoes for tomato paste making.

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

Step 3: Demonstrate how to crush tomatoes for tomato paste making. While demonstrating, explain clearly crushing techniques as used in tomato pulp extraction.

Step 4: Ask trainees to crush tomatoes and monitor trainees' activities.

Step 5: Verify if tomatoes are well crushed and provide feedback on each trainee's product

Step 6: Ask trainees to read key reading 2.1.1 in the trainee manual

Step 7: Ask trainees to perform the task provided in the application of learning 2.1



Points to Remember

- Always wear PPE while crushing tomatoes.
- Crush tomatoes evenly to produce a good quality tomato pulp.
- If you are using a crushing machine, pay attention to your fingers when feeding in.



Practical Activity 2.1.2: Separating tomato pulp components



Notes to the trainer

The trainer may:

- Facilitate every trainee to separate tomato pulp components.
- Avail tools and equipment used in tomato pulp sedimentation and filtration.
- Avail some videos related to the separation of tomato pulp components to be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go to the tomato paste and ketchup making workshop to separate tomato pulp components.

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

Step 3: Demonstrate how to separate tomato components. While demonstrating, explain clearly the separation techniques used in separating tomato pulp components.

Step 4: Ask trainees to do the task individually and monitor trainees' activities.

Step 5: Verify whether tomato pulp is well separated and provide feedback on each trainee's product

Step 6: Ask trainees to read key reading 2.1.2 in the trainee manual

Step 7: Ask trainees to perform the task provided in the application of learning 2.1



Points to Remember

- When separating components in tomato pulp, it is better to apply good hygiene practices.
- Use carefully filters and strainers to avoid clogging.



Practical Activity 2.1.3: Checking the quality of tomato pulp



Notes to the trainer

The trainer may:

- Facilitate each trainee to check the quality of tomato pulp.
- Avail tools required to check the quality of tomato pulp.
- Avail testing protocols to be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go to the tomato paste and ketchup making workshop to check the quality of tomato pulp for tomato paste making.

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

Step 3: Demonstrate how to check the quality of tomato pulp for tomato paste making. While demonstrating, explain clearly the tests used in checking tomato pulp.

Step 4: Ask trainees to do the task individually and monitor trainees' activities.

Step 5: Verify if tomato pulp quality is properly checked and provide feedback on each trainee's product.

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

- The quality of tomato pulp greatly will affect the quality of tomato paste thus make sure to follow all processing steps leading to good quality tomato pulp.
- Often check physical and chemical parameters to monitor changes in the pulp.



Application of learning 2.1.

In the tomato paste and ketchup-making workshop, request each trainee to crush, and separate tomato pulp components and check the quality of tomato pulp.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Tomato is properly crushed	1.1 Crushing techniques are applied		
		1.2 Tomato pulp is availed		
2	Components are clearly separated	2.1 Separation equipment is selected		
		2.2 Seeds and peels are separated		
3	The quality of tomato pulp is adequately checked	3.1 Organoleptic test is done		
		3.2 Chemical parameters are checked		
		3.3 Records are kept		
4	The activity report is well done	4.1 The activity report is availed		
		4.2 Key competencies gained are described		
		4.3 Recommendations are mentioned		



Indicative content 2.2: Cooking and concentrating tomato pulp



Duration: 5 hrs



Practical Activity 2.2.1: Cooking tomato pulp

Notes to the trainer

The trainer may:

- Facilitate each trainee to cook the tomato pulp.
- Avail tools and equipment required in cooking tomato pulp.
- Avail some videos related to cooking tomato pulp to be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go to the tomato paste and ketchup making workshop to cook the tomato pulp for tomato paste making.

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

Step 3: Demonstrate how to cook tomato pulp. While demonstrating, explain clearly the quality specification of tomato pulp for tomato paste making.

Step 4: Ask trainees to do the task individually and monitor trainees' activities.

Step 5: Verify whether pulp is well cooked and provide feedback on each trainee's product.

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

- Choose the cooking techniques that are suitable for the equipment you are using.
- Cooking tomato pulp is a critical step in tomato paste and ketchup.



Practical Activity 2.2.2: Adding ingredients into tomato pulp



Notes to the trainer

The trainer may facilitate each trainee to add ingredients in tomato pulp.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go to the tomato paste and ketchup making workshop to add ingredients to tomato pulp.

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

Step 3: Demonstrate how to add ingredients to tomato pulp. While demonstrating, explain clearly the role of each ingredient in tomato paste.

Step 4: Ask trainees to do the task individually and monitor trainees' activities.

Step 5: Verify whether ingredients are correctly added to the pulp.

Step 6: Ask trainees to read key reading 2.2.2 in the trainee manual

Step 7: Ask trainees to perform the task provided in the application of learning 2.2.



Points to Remember

- Strictly follow the recommended dosages of ingredients for tomato paste.



Application of learning 2.2.

In the school 's tomato pastes and ketchup making workshop, request each trainee to cook and add ingredients in tomato pulp.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Tomato pulp is properly cooked	1.1 Cooking equipment is selected		
		1.2 The water content of the pulp is achieved		
2	Ingredients are correctly added	2.1 Ingredients are selected		
		2.2 Dosages are respected		
3	The activity report is well done	3.1 Activity report is availed		
		3.2 Key competencies gained are described		
		3.3 Recommendations are mentioned		



Indicative content 2.3: Cooling of tomato paste.



Duration: 5hrs



Practical Activity 2.3.1: Cooling tomato paste



Notes to the trainer

The trainer may:

- Facilitate each trainee to cool tomato paste.
- Avail thermometers.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go to the tomato paste and ketchup making workshop to cool tomato paste.

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

Step 3: Demonstrate how to cool tomato paste. While demonstrating, explain clearly cooling techniques of tomato paste.

Step 4: Ask trainees to do the task individually and monitor trainees' activities.

Step 5: Verify if tomato paste is properly cooled and provide feedback on each trainee's product.

Step 6: Ask trainees to read key reading 2.3.1 in trainee manual

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



Points to Remember

- Respect the tomato paste cooling conditions to prevent the growth of harmful bacteria.



Application of learning 2.3.

In the school's tomato paste and ketchup making workshop, request each trainee to cool tomato paste.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Tomato paste is properly cooled	1.1 Cooling techniques are applied		
		1.2 Cooling temperature is respected		
2	The activity report is well done	2.1 The activity report is available		
		2.2 Key competencies gained are described		
		2.3 Recommendations are mentioned		



Indicative content 2.4. Checking the quality of tomato paste



Duration: 5hrs



Practical Activity 2.4.1: Checking the quality of tomato paste



Notes to the trainer

The trainer may:

- Facilitate each trainee to check the quality of tomato paste.
- Avail tools used in checking the quality of tomato paste.
- Avail videos relating to tests for checking the quality of tomato paste to be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go to the tomato paste and ketchup making to check the quality of tomato paste.

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

Step 3: Demonstrate how to check the quality of tomato paste. While demonstrating, explain clearly quality tests for tomato paste.

Step 4: Ask trainees to check the quality parameter of tomato paste and ketchup then monitor trainees' activities.

Step 5: Verify if tomato paste quality is properly checked and provide feedback on each trainee's product.

Step 6: Ask trainees to read key reading 2.4.1 in trainee manual

Step 7: Ask trainees to perform the task provided in application of learning 2.4



Points to Remember

- Check the quality of tomato paste before packaging.
- Record results obtained in recording book.
- Always compare the results with standards.



Application of learning 2.4.

In the school's tomato paste and ketchup making workshop, request each trainee to check the quality of tomato paste.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Tomato paste quality is properly checked	1.1 Testing tools and equipment are selected		
		1.2 Organoleptic test is done		
		1.3 Chemical parameters are tested		
2	The activity report is well done	2.1 The activity report is available		
		2.2 Key competencies gained are described		
		2.3 Recommendations are mentioned		



Learning Outcome 2 end Assessment

Theoretical assessment

1. Read the following statements related to the quality of tomato pulp and answer **True** for the correct statement and **False** for the wrong statement

a) The colour of tomato pulp depends on the variety of tomatoes used, the ripeness of the tomato, and the processing method.

Answer: True

b) Tomato pulp should have a Brix value of at least 50-60%.

Answer: False

c) Tomato pulp should have a moisture content of no more than 58%.

Answer: False

d) Tomato pulp should have a pH of 6.

Answer: False

e) The flavour of tomato pulp depends on the variety of tomatoes used, the ripeness of the tomato, and the processing method.

Answer: True

2. Read the following statements related to the quality of tomato paste and answer **True** if the statement is correct and **False** if it is wrong.

I. High-quality tomato paste has a bright red colour.

Answer: True

II. Low-quality tomato paste has a watery texture.

Answer: True

III. The sugar content of tomato paste is typically between 3.8 % and 4.5%. A higher sugar content may indicate that the paste has been made from overripe tomatoes or that it contains added sugar.

Answer: False

IV. The pH of tomato paste is typically between 5 and 5.5.

Answer: False

V. The moisture content of tomato paste is typically between 70% and 80%. Higher moisture content may indicate that the paste is less concentrated or that it has been adulterated with water.

Answer: True

3. Circle the letter corresponding to the right answer:

I. The following are the purpose of cooking tomato pulp except;

a) Increasing the total soluble solids in the product

- b) Increasing the product consistency
- c) Increasing the acidity in the product
- d) Removing excess of water from the pulp

Answer: C) Increasing the acidity in the product

- II. The following are the purpose of adding ingredients in tomato pulp except;
- a) To improve the flavour
 - b) To adjust the consistency
 - c) To improve the shelf life
 - d) To reduce the production price
 - e) To prevent the growth of bacteria and molds

Answer: d) To reduce the market price

Practical assessment

Your school is planning to host guests from the district. In their lunch preparation, tomato paste will be used. Ask each trainee to go to the food processing to make tomato paste for used in that event.

1. To mix ingredients for 1 kg of tomato pulp
2. To cook and concentrate tomato pulp
3. To cool and preserve tomato paste
4. To check the quality of tomato paste

The task should be completed in 3 hours.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Tomato pulp is well extracted.	1.1 Tomatoes are crushed		
		1.2 Seeds are removed		
		1.3 Skin is removed		
2	Tomato pulp quality is well-checked	2.1 Tomato brix content is measured		
		2.2 pH of pulp is measured		
		2.3 Organoleptic test is done		
3	Tomato pulp is properly cooked	3.1 Cooking conditions is respected.		
		3.2 Salt ratio is respected		
		3.3 Stirring is done during cooking		
		3.4 Preservative ratio is respected		
4	Tomato paste is well cooled	4.1 Cooling conditions are respected		
		4.2 Cooling is done		

5	Quality of tomato paste is properly checked	5.1 pH of tomato paste is respected		
		5.2 Brix is respected		
		5.3 Viscosity of tomato paste is respected		
		5.4 Organoleptic test is done		
6	Activity report is well done	6.1 Activity report is availed		
		6.2 Key competencies gained are described		
		6.3 Recommendations are mentioned		

END



Further information to the trainer

Tomato Paste Plant: <https://www.scribd.com/document/126704148/Tomato-Paste-Plant>

Tomato Paste Production Business Plan: <https://techqu.co.in/how-to-start-a-tomato-processing-business/>

Tomato Paste Production Flowchart: <https://aradbranding.com/en/tomato-paste-processing-pdf/>

Learning Outcome 3: Make tomato ketchup



Indicative contents

3.1 Adding ingredients

3.2 Cooking and concentrating tomato pulp

3.3 Cooling of tomato ketchup

3.4 Checking quality of tomato Ketchup

Key Competencies for Learning Outcome 3 : Make tomato ketchup

Knowledge	Skills	Attitudes
• Explanation on purpose of adding ingredients in tomato ketchup making. • Identification of mixing ratio for tomato ketchup making • Explanation on purpose of cooking tomato pulp for ketchup making • Description of cooking techniques for tomato ketchup making • Identification of cooking conditions for tomato ketchup making • Explanation on purpose of cooling tomato ketchup • Identification of cooling conditions for tomato ketchup making • Explanation on preservation of tomato ketchup • Description on quality characteristics of ketchup	• Mixing of ingredients for tomato ketchup making • Cooking and concentrating tomato pulp for making ketchup • Cooling tomato ketchup • Checking the quality of tomato ketchup	• Paying attention during session delivery. • Being precise while weighing ingredients. • Being good time manager while cooking and cooling tomato ketchup. • Being carefully while checking the quality of tomato ketchup



Duration: 20 hrs

Learning outcome 3 objectives:



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

1. Explain effectively the purpose of adding ingredients in tomato pulp
2. Calculate correctly ratio of ingredients used for tomato ketchup making
3. Explain clearly the purpose of cooking
4. Concentrate correctly tomato pulp for ketchup making
5. Perform properly mixing and addition of ingredients used for tomato ketchup making
6. Explain clearly the cooling process for tomato ketchup making.
7. Check appropriately the quality characteristics of tomato ketchup



Resources

Equipment	Tools	Materials
• Gas Stove • Steamer • Evaporator • Cooling tank • Mixing tank • Homogenizer	• pH Meter • refractometer • Stillers/Agitator • Thermometer • Stainless knives • Graduated jugs • Graduated cylinder • Cooking pan • Gas lighter • Stainless working Table • Electronic Balance • PPE	• Tomato pulp • Chili pepper • Garlic • Onions • Table salt • Vinegar • Sodium benzoate • Citric acid • Xanthan gum • Potassium sorbate • Disinfectant • Detergent



Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- ✓ Ensure that classroom and workshop are available

- ✓ Avail manuals/guides, pictures, images, videos and audio visuals related to tomato ketchup making as didactic materials
- ✓ Ensure that tools and equipment for tomato ketchup making are available and are in good working conditions.
- ✓ Have tomato pulp for ketchup making



Indicative content 3.1: Adding Ingredients



Duration: 5 hrs



Theoretical Activity 3.1.1: Explanation on the purpose of adding ingredients in tomato pulp and their ratio



Notes to the trainer:

Trainer may

- Use small groups to explain the purpose of adding ingredients in tomato pulp
- Facilitate trainee to elaborate the ratio of ingredients used in tomato ketchup making.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the session and ask trainees to answer the following questions:

- i. What could be the purpose of adding ingredients in tomato pulp for ketchup making?
- ii. What could be the ratio of different ingredients used in tomato ketchup making?

Step 2: Facilitate trainees to write the findings on papers, flip chart, blackboard or white boards

Step 3: Ask trainees to present their findings

Step 4: Provide expert view and clarify ideas 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

- The ratio of ingredients should be respected in order to produce the product of good quality.
- After adding the ingredients, stir frequently until they are well combined

- Read the expiration date of the ingredients on their labels.



Practical Activity 3.1.2: Mixing of ingredients for ketchup making



Notes to the trainer

The trainer may:

- Facilitate every trainee to mix ingredients in tomato pulp for ketchup making.
- Avail all tools and equipment used in mixing ingredients for ketchup-making
- Avail some videos related to mixing ingredients for ketchup making.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go to the tomato paste and ketchup making workshop to mix ingredients for ketchup making.

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

Step 3: Demonstrate how you can mix ingredients for ketchup making. While demonstrating, explain clearly how mixing of ingredients is done for ketchup making.

Step 4: Ask trainees to do the task individually and monitor trainees' activities.

Step 5: Verify whether ingredients are appropriately mixed and provide feedback on each trainee's product.

Step 6: Ask trainees to read key reading 3.1.2 in the trainee manual

Step 7: Ask trainees to perform the task provided in application of learning 3.1



Points to Remember

- The ratio of ingredients should be respected in order to produce the product of good quality.
- After adding the ingredients, stir frequently until they are well combined
- Read the expiration date of the ingredients on their labels.



Application of learning 3.1.

In the workshop of tomato paste and ketchup making, request every trainee to mix ingredients for tomato ketchup making.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Tomato ketchup is well-cooked	1.1 Mixing ratio is respected		
		1.2 The mixing procedure is respected		
		1.3 Stirring is done		
		1.4 Tomato ketchup viscosity is achieved		
2	The activity report is well done	2.1 The activity report is availed		
		2.2 Key competencies gained are described		
		2.3 Recommendations are mentioned		



Indicative content 3.2: Cooking and concentrating tomato pulp



Duration: 6 hrs



Theoretical Activity 3.2.1: Description of cooking and concentration of tomato pulp for ketchup making

Notes to the trainer:

Trainer may:

- Use small groups to describe cooking and concentration of tomato pulp for ketchup making
- Avail some videos related to cooking and concentration of tomato pulp for ketchup making.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the session and ask trainees to answer the following questions:

- i. What could be the purpose of cooking tomato pulp for ketchup making?
- ii. Explain how do you think monitoring of cooking conditions while cooking tomato pulp for ketchup making should be done.

Step 2: Facilitate trainees to write the findings on paper, flip charts, blackboards or whiteboards

Step 3: Ask trainees to present their findings

Step 4: Provide an expert view and clarify ideas using didactic materials

Step 5: Address any questions or concerns

Step 6: Ask trainees to read the key reading 3.2.1 in the trainee manual



Points to Remember

- The tomato pulp should be cooked at a temperature that is high enough to inactivate enzymes and remove excess water.



Practical Activity 3.2.2: Cooking and concentrating tomato pulp for ketchup making



Notes to the trainer

The trainer may:

- Facilitate every trainee to cook the tomato pulp for ketchup making.
- Avail all tools and equipment used in cooking tomato pulp for ketchup making.
- Avail some videos related to cooking and concentration of tomato pulp for ketchup making.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go to the tomato paste and ketchup making workshop to cook/concentrate the tomato pulp for making tomato ketchup.

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

Step 3: Demonstrate how you can cook/concentrate the tomato pulp for tomato ketchup making. While demonstrating, explain clearly the procedures that are used in cooking tomato pulp for ketchup making.

Step 4: Ask trainees to do the task individually and monitor trainees' activities.

Step 5: Verify whether ketchup is appropriately cooked/concentrated and provide feedback on each trainee's product.

Step 6: Ask trainees to read key reading 3.2.2 in the trainee manual

Step 7: Ask trainees to perform the task provided in the application of Learning 3.2



Points to Remember

- Cooking conditions (time and temperature) should be well monitored to produce a good product with good texture.
- While cooking tomato pulp don't forget to stir regularly to prevent it from sticking to the bottom of the cooking vessel.
- During cooking check the viscosity of ketchup to avoid burning and change of flavour.
- The tomato pulp should be cooked at a temperature that is high enough to inactivate enzymes and remove excess water.



Application of learning 3.2.

In the workshop of tomato paste and ketchup making, request each trainee to cook and concentrate tomato pulp for making ketchup.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Tomato ketchup is well-cooked	1.1 Cooking temperature is controlled		
		1.2 Cooking time is respected		
		1.3 stirring is done		
		1.4 Tomato ketchup viscosity is achieved		
2	The activity report is well done	2.1 Activity report is availed		
		2.2 Key competencies gained are described		
		2.3 Recommendations are mentioned		



Indicative content 3.3: Cooling of tomato ketchup



Duration: 3 hrs



Theoretical Activity 3.3.1: Explanation of cooling and preservation of tomato ketchup



Notes to the trainer:

The trainer may:

- Facilitate every trainee to monitor cooling conditions of tomato ketchup.
- Avail all tools used in monitoring cooling conditions of tomato ketchup.



Key steps:

Step 1: Introduce the session and ask trainees to answer the following questions:

- i. What could be the cooling conditions of tomato ketchup?
- ii. What do you understand on preservation methods of tomato ketchup?

Step 2: Facilitate trainees to write their findings on papers, flip chart, blackboard or white boards

Step 3: Ask trainees to present their findings

Step 4: Provide expert view and clarify ideas 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

- Cooling conditions should be well monitored to prevent the microbial spoilage or the growth of harmful bacteria.
- The process of cooling tomato ketchup should be well controlled in order to avoid cross-contamination of the product.
- Tomato ketchup must be preserved in order to extend its shelf life
- Always check the expiration date of chemical preservatives.



Application of learning 3.3.

In the workshop of tomato paste and ketchup making, request each trainee to cool and preserve tomato ketchup.

Checklist

SN	Criteria	Indicators	Yes	No
1	Tomato ketchup is appropriately cooled and preserved.	1.1 Cooling temperature is controlled		
		1.2 Cooling time is respected		
		1.3 preservation technic is performed		
2	Activity report is well done	2.1 Activity report is availed		
		2.2 Key competencies gained are described		
		2.3 Recommendations are mentioned		



Indicative content 3.4. Checking quality of tomato paste



Duration: 6 hrs



Practical Activity 3.4.1: Checking the quality of tomato ketchup



Notes to the trainer

The trainer may:

- Facilitate every trainee to check the quality of tomato paste.
- Avail all tools used in checking the quality of tomato paste.
- Avail some videos related to quality check of tomato ketchup to be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go to the tomato paste and ketchup making workshop to check the quality of tomato ketchup.

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

Step 3: Demonstrate how you check the quality of tomato ketchup. While demonstrating, explain clearly the quality characteristics of tomato ketchup.

Step 4: Ask trainees to do the task individually and monitor trainees' activities.

Step 5: Verify whether tomato ketchup quality is properly checked and provide feedback on each trainee's product.

Step 6: Ask trainees to read key reading 3.4.1 in trainee manual

Step 7: Ask trainees to perform the task provided in application of learning 3.4



Points to Remember

- Different tests are used to check the quality of ketchup such as organoleptic tests, sugar tests, pH tests, and moisture content.
- It is better to calibrate the tools to be used before checking the chemical quality of ketchup
- While performing the chemical test (sugar content, pH, and moisture content), it is better to check the sample to be sure of the obtained result.
- For the organoleptic test, it is better to judge the product correctly to avoid any mistake that can lead to the loss of the product.



Application of learning 3.4.

In the workshop of tomato paste and ketchup making, request each trainee to check the quality of tomato ketchup by using the following test:

- 1) Organoleptic test
- 2) pH test
- 3) Moisture content test
- 4) Sugar test

Checklist:

SN	Criteria	Indicators	Yes	No
1	Tomato ketchup quality is accurately checked	1.1 Organoleptic test is performed		
		1.2 pH test is performed		
		1.3 Moisture content is performed		
		1.4 Sugar test is performed		
2	The activity report is well done	2.1 Activity report is availed		
		2.2 Key competencies gained are described		
		2.3 Recommendations are mentioned		



Learning Outcome 3 end Assessment

Theoretical assessment

1. Fill in the blank space with sugar, vinegar, garlic, and potassium sorbate as ingredients used in tomato ketchup-making

a. is added to the ketchup to extend its shelf life.

Answer: Potassium sorbate

b. adds sweetness to the ketchup and helps to balance out the acidity of the tomatoes and vinegar.

Answer: Sugar

c. is added to enhance the flavour of the ketchup.

Answer: Garlic powder

d. provides acidity and tanginess to the ketchup. It also acts as a preservative.

Answer: Vinegar

2. Read the following statement, answer **True** if the statement is correct and **False** if the statement is not correct.

The purpose of cooking tomato pulp is to:

a. Increase the hardness of the tomato pulp and make it easier to process.

Answer: False

b. Activate enzymes that can cause spoilage.

Answer: False

c. Remove excess water and concentrate the tomato solids.

Answer: True

d. Make the tomato pulp more stable for storage

Answer: True

e. Develop the flavour of the tomato pulp.

Answer: True

3. In the table below, match the advantages or disadvantages of the cooking method by writing a tick in the corresponding cooking method column.

Advantages or disadvantages	Open steam jacketed kettle	Vacuum pan
a) Fast cooking time	✓	
b) Even cooking	✓	
c) More energy-efficient.		✓

d) Can cause some loss of flavour and nutrients	✓	
e) Preserves more flavour and nutrients		✓

4. Choose the letter corresponding to the best answer

- a. The tomato ketchup should be cooled to a temperature below 40°C within 2 hours.
- b) The tomato ketchup should be cooled to a temperature below 20°C within 2 hours.
- c) The tomato ketchup should be cooled to a temperature below 30°C within 2 hours.
- d) The tomato ketchup should be cooled to a temperature below 40°C within 4 hours.
- e) The tomato ketchup should be cooled to a temperature below 40°C within 24 hours.

Answer:

a) The tomato ketchup should be cooled to a temperature below 40°C within 2 hours

5. The following are the steps to follow while using digital refractometer for measuring sugar content, rearrange them in a logical sequence:

- a. Clean the test area and prism with a clean and soft textile or paper towel before applying the test sample.
- b. Switch on the device.
- c. Apply a small amount of the ketchup sample to the test area. Then press the Read button.
- d. Clean the test area immediately after use
- e. After a few seconds the reading will be displayed on the screen.

Answer:

- a. Switch on the device.**
- b. Clean the test area and prism with a clean and soft textile or paper towel before applying the test sample.**
- c. Apply a small amount of the ketchup sample to the test area. Then press the Read button.**
- d. After a few seconds the reading will be displayed on the screen.**
- e. Clean the test area immediately after use.**

Practical assessment

There is a school event on labour's day. At lunch time, ketchup will be used to serve the guests and teaching staff. In the workshop of tomato paste and ketchup processing, request each trainee to make tomato ketchup to be used in that event.

Task:

- 1. To mix ingredients for 5 kg of tomato pulp
- 2. To cook and concentrate tomato pulp
- 3. To cool and preserve tomato ketchup
- 4. To check the quality of tomato ketchup

The task should be completed in 3 hours

Checklist:

SN	Criteria	Indicators	Yes	No
1	Ingredients are well-mixed	1.1. Mixing ratio is respected		
		1.2. Mixing procedure is followed		
		1.3 stirring is done		
2	Tomato ketchup is well-cooked	2.1. Cooking technique is applied		
		2.2. Cooking time is respected		
		2.3. Cooking temperature is respected		
		2.4. Stirring is done		
3	Tomato ketchup is well-cooled and preserved	3.1. Cooling time is respected		
		3.2. Cooling temperature is controlled		
		3.3. Preservation technic is applied		
4	Tomato ketchup quality is checked	4.1. Sugar content is measured		
		4.2. pH is measured		
		4.3. Moisture content is measured		
		4.4. Color is achieved		
		4.5. Flavor is achieved		
		4.6. Taste is achieved		
		4.7. Viscosity is achieved		



Further information to the trainer

Abdulmalik I., Amonye, M., Ambali, A., Umeanuka, P. and Mahdi, M. (2014): Appropriate Technology for Tomato Powder Production. Volume 3, Issue 8. Nigeria: International Journal of Engineering Inventions 6. Fenco (2014): Tomato Paste Processing. www.fenco.it/eng/tomato-paste-processing.asp Accessed 24/09/2014. Fenco Food Machinery

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END

Learning Outcome 4: Package The Product



Indicative contents

4.1 Filling of tomato paste and ketchup into packaging materials

4.2 Label tomato paste and ketchup

4.3 Storing of tomato paste and ketchup

Key Competencies for Learning Outcome 4: Package the Product

Knowledge	Skills	Attitudes
- Explanation on the purpose of packaging tomato Paste and ketchup - Explanation on the purpose of labelling tomato Paste and ketchup - Identification of labelling information	- Sterilizing packaging material - Packaging tomato paste and ketchup - Perform labelling - Monitoring storage conditions	- Being attentive during session delivery. - Being a good time manager while sterilizing packaging materials - Being careful while sterilizing, packaging and labelling glass bottle. - Being precise while packaging tomato paste and ketchup.



Duration: 10 hrs

Learning outcome 4 objectives:



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

1. Sterilise properly packaging material used for tomato paste and ketchup making.
2. Package properly the tomato paste and ketchup according to packaging levels
3. Identify adequately labelling information for tomato paste and ketchup.
4. Perform appropriately labelling of tomato paste and ketchup as per labelling techniques
5. Monitor properly the stores of tomato paste and ketchup referring to the storage conditions.



Resources

Equipment	Tools	Materials
● Filling Machine ● Sealer ● Labelling machine	● Working Tables ● Electronic Balance ● PPE ● Funnel ● Shelves ● Thermometer ● Paper cutter ● pH Meter ● Refractometer ● Basins ● Basket	● Disinfectant ● Detergents ● Packaging materials ● Labels ● Scotch ● Glue ● Papers ● Pens ● Gloves ● Recording books



Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Ensure that the classroom and workshop are available.
- Avail manuals/guide, audio visuals, pictures, videos, illustration related to packaging and storage of tomato paste and ketchup.
- Avail tools and equipment for packaging and storage of tomato paste and ketchup.



Indicative content 4.1: Filling of tomato paste and ketchup into packaging materials



Duration: 4 hrs



Practical Activity 4.1.1: Sterilizing packaging materials for tomato paste and ketchup



Notes to the trainer

The trainer may:

- Avail chemical sterilization products to be used in sterilization
- Avail packaging materials.
- Avail pictures, drawings, videos related to sterilization methods as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go in tomato paste and ketchup processing workshop to sterilize packaging materials for tomato paste and ketchup.

Step 2: Explain the task and provide clear working instructions (PPE, Time allocated)

Step 3: Demonstrate how to sterilize packaging materials for tomato paste and ketchup.

While demonstrating, explain clearly the methods of sterilizing packaging materials for tomato paste and ketchup.

Step 4: Ask trainees to do the task individually and monitor trainees' activities.

Step 5: Verify whether packaging materials for tomato paste and ketchup are properly sterilized and provide feedback on each trainee's work.

Step 6: Ask trainees to read key reading 4.1.1 in trainee manual.

Step 7: Ask trainees to perform the task provided in application of learning 4.



Points to Remember

- Sterilization is done to kill microorganisms that may be present on packaging materials.
- Heat sterilization is done by exposing packaging materials to high temperatures for a short period.
- For chemical sterilization, the packaging materials are treated with a chemical solution



Practical Activity 4.1.2: Packaging tomato paste and ketchup



Notes to the trainer

Trainer may:

- Facilitate each trainee in packaging the tomato paste and ketchup.
- Avail all tools and equipment required for accomplishing this task.
- Avail videos related to packaging of tomato paste and ketchup.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go to the tomato paste and ketchup making to package tomato paste and ketchup.

Step 2: Explain the task and provide clear working instructions (PPE, Time allocated)

Step 3: Demonstrate how to pack tomato paste and ketchup. While demonstrating, explain clearly the procedures for packaging tomato paste and ketchup.

Step 4: Ask trainees to do the task individually and monitor trainees' activities.

Step 5: Verify whether tomato paste and ketchup are properly packaged and provide feedback on each trainee's product

Step 6: Ask trainees to read key reading 4.1.2 in trainee manual.

Step 7: Ask trainees to perform the task provided in application of learning 4.1



Points to Remember

- Wear gloves when packaging tomato paste and ketchup.
- Always choose the suitable packaging material considering the following criteria; food safety, airtightness, durability, attractiveness and sustainability.
- Be careful not to overfill the containers. Leave about 1/2 inch of space at the top of the container to allow for expansion.
- Tightly seal the lids on the containers to prevent leakage.



Application of learning 4.1.

In the workshop of tomato paste and ketchup making, request every trainee:

- To sterilise the packaging materials for tomato paste and ketchup
- To pack the tomato paste and ketchup.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Tomato paste and ketchup packaging materials are well sterilised	1.1 Sterilisation methods are applied		
		1.2 Chemical sterilisation products are selected		
		1.3 Packaging materials are sterilized		
2	Tomato paste and ketchup are well packaged	2.1 Tomato paste and ketchup packaging materials are selected		
		2.2 Filling is done		
		2.3 Sealing is done		
3	The activity report is well done	3.1 The activity report is availed		
		3.2 Key competencies gained are described		
		3.3 Recommendations are mentioned		



Indicative content 4.2: Label tomato paste and ketchup



Duration: 3 hrs



Practical Activity 4.2.1: Labelling the packaged tomato paste and ketchup



Notes to the trainer

The trainer may:

- Request each trainee to label packaged tomato paste and ketchup.
- Avail all required tools to accomplish this task.
- Avail some drawings and pictures related to labelling to be used as didactic materials



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go to the tomato paste and ketchup making workshop to label packaged tomato paste and ketchup.

Step 2: Explain the task and provide clear working instructions (PPE, Time allocated)

Step 3: Demonstrate how to label packaged tomato paste and ketchup. While demonstrating, explain clearly techniques of tomato paste and ketchup labelling.

Step 4: Ask trainees to do the task individually and monitor trainees' activities.

Step 5: Verify whether packaged tomato paste and ketchup are properly labelled and provide feedback on each trainee's product

Step 6: Ask trainees to read key reading 4.2.2 in trainee manual.

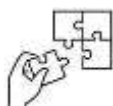
Step 7: Ask trainees to perform the task provided in application of learning 4.2



Points to Remember

- Use a font size that is large enough to be easily read.

- Use clear and concise language.
- Avoid using any jargon or technical terms that consumers may not understand.
- Make sure that the information on the label is accurate and up-to-date.
- Highlight the key features of your product, such as its type, floral source, and nutritional value.
- Use attractive and eye-catching designs to make your product stand out on the shelf



Application of learning 4.2.

In the workshop of tomato paste and ketchup making, request every trainee to label packaged tomato paste and ketchup.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Tomato paste and ketchup are well labelled	1.1 Tomato paste and ketchup labelling materials are selected		
		1.2 Tomato paste and ketchup labelling tools are selected		
		1.3 Tomato paste and ketchup labelling methods are applied		
2	The activity report is well done	2.1 The activity report is availed		
		2.2 Key competencies gained are described		
		2.3 Recommendations are mentioned		



Indicative content 4.3: Storing of tomato paste and ketchup



Duration: 3 hrs



Practical Activity 4.3.1: Monitoring the storage conditions



Notes to the trainer

Trainer may:

- Request each trainee to monitor tomato paste and ketchup storage conditions.
- Avail all required tools and equipment to accomplish this task.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to go to the tomato paste and ketchup workshop to monitor tomato paste and ketchup storage conditions.

Step 2: Explain the task and provide clear working instructions (PPE, Time allocated)

Step 3: Demonstrate how to monitor tomato paste and ketchup storage conditions. While demonstrating, explain clearly tomato paste and ketchup storing conditions.

Step 4: Ask trainees to do the task individually and monitor trainees' activities.

Step 5: Verify whether tomato paste and ketchup are appropriately stored and provide feedback on each trainee's product.

Step 6: Ask trainees to read key reading 4.3. 1 in the trainee manual.

Step 7: Ask trainees to perform the task provided in the application of Learning 4.3



Points to Remember

- The temperature of the storage area should be monitored regularly to ensure that the tomato paste, and ketchup are being stored at the proper temperature.
- The humidity of the storage area should be monitored regularly to ensure that the tomato paste, and ketchup are not being stored in a humid environment
- Both tomato paste and ketchup prefer a cool, dark environment, ideally below 70°F (21°C).



Application of learning 4.3.

In the store of tomato paste and ketchup making workshop, request every trainee to monitor tomato paste and ketchup storage conditions.

Checklist:

SN	Criteria	Indicators	Yes	No
1	Tomato paste and ketchup storage conditions are precisely controlled	1.1 The temperature of the store is recorded		
		1.2 Humidity of store is recorded		
		1.3 Light is controlled		
		1.4 The recording book is filled		
2	The activity report is well done	2.1 Activity report is available		
		2.2 Key competencies gained are described		
		2.3 Recommendations are mentioned		



Learning Outcome 4 end Assessment

Theoretical assessment

1. Read the following statement and answer **True** for the correct statement and **False** for the wrong statement.

- I. Sterilization of packaging materials is done to kill any microorganism that may be present on the packaging material.

Answer: True

- II. For heat sterilization, the packaging materials are exposed to low temperatures for a short time.

Answer: False

- III. For chemical sterilization, the packaging materials are treated with a chemical solution.

Answer: True

- IV. Hydrogen peroxide is an example of heat sterilization.

Answer: False

2. Circle the letter corresponding to the right answer. Which one of the following is the purpose of labelling tomato paste and ketchup packaging material?

- a) Labelling helps to identify the product contained in the packaging material.
- b) Labelling serves to inhibit microbial attack on tomato paste and ketchup.
- c) To provide the information about the end user of tomato paste and ketchup

Answer: a

Practical assessment

There is a school event on labour's day. At the lunch time, tomato paste and ketchup will be used to serve the guests and teaching staff. You are requested to go to the tomato paste and ketchup-making workshop to package and store tomato paste and ketchup to be used in that event.

Task:

1. To sterilise the packaging materials to be used for packaging tomato paste and ketchup
2. To package and label 5kg of tomato paste and 3 kg of ketchup.
3. To store tomato paste and ketchup in favourable conditions.

The task should be completed in 2 hours

Checklist:

SN	Criteria	Indicators	Yes	No
1	Packaging materials are well sterilised	1.1 Chemical sterilisation products are selected		
		1.2 Sterilisation methods are applied		
		1.3 Packaging materials are sterilized		
2	Tomato paste and ketchup are properly packaged	2.1. Packaging equipment is used		
		2.2.Filling is well done		
		2.3.Sealing is well done		
3	Tomato paste and ketchup are properly labelled	3.1. Labelling equipment and tools are well-used		
		3.2. Labelling information is mentioned		
		3.3.Labels are appropriately applied		
4	Tomato paste and ketchup are well-kept	4.1. Storage equipment and tools are used		
		4.2. Storage techniques are applied		
		4.3. Storage conditions are respected		



Further information to the trainer

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