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PRODUCT AND PROCESS DEVELOPMENT

for

Training Women Entrepreneurs in the Food Processing Industry

by

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INTRODUCTION

In Ghana the number of women engaged in food production and processing industry is greater than in other industries that is any other income-generating activities. In the rural areas where farming activities go on, women process and preserve most of the farm as well as marine produce.

In the urban and city centres they are engaged in processing "ready to eat foods". All these women have very little or no education. Despite the fact that there are many training programmes going on they seem to have been left out because the training of such women need to be adapted to their peculiar situations. The skills and technologies being used by these women in processing foods were passed on by their grandparents. The enterprises are normally very small but by giving them entrepreneurial, managerial and technical training these micro enterprises can grow into small scale food processing industries.

In addition to women in the micro industrial sector, there are few women engaged in food processing on small scale in the formal sector. The food processing industry sector has potentials which has not yet been fully exploited. By making a conscious effort to provide the right type of training to these women who are already engaged in these enterprises, as well as training the young graduates from the technical schools and the universities to exploit this fertile economic field would not only help solve Africa's food problems but it will also strengthen women's economic capacity and create jobs for many unemployed women graduates.

ADDITIONAL TECHNOLOGY

Traditionally many Ghanaians do not eat fruits on regular basis but as the educated population gets growing and the people are getting to learn about balanced diet and nutrition the demand for fruit products has increased greatly during the past few decades. Until recently, when the economy of the country started going down all the boarding schools were being served with marmalade jams and fruit juice.

There is a variety of fruits grown in Ghana though large scale production has not been the case. In recent years many growers have been encouraged to go into large scale plantation of growing fruits; and this has resulted in exportation of Ghanaian pineapples to different parts of the world. Fruits processing is an area which is wide and varied and this is not yet exploited fully. Machinery for fruits processing is not readily available locally. There is the need therefore not only to train educated women in fruits processing which requires a more advanced technology than those being used in the system but also making available appropriate machinery/technology to support the fruit processing industries.

PRODUCTS AND PROCESSES

FRUITS AND VEGETABLES

1.1 Pectin Stock

PRODUCT/PROCESS DESCRIPTION

Pectin is a gum like substance found in the pips and between the green and white part of citrus peel. Pectin makes jams and jellies set. In developing countries where commercial pectin is not readily available this product can be obtained by boiling one pound each of grapefruits, oranges, lemon/sour oranges with 5 litres (9 pints) of water.

Principles of Preservation and Methods of Processing

There are two methods/principles of preserving the product: by storage or by adding a chemical preservative. Under refrigeration temperatures micro-organisms are inactivated. When a chemical preservative e.g. potassium metabisulphite is added micro-organisms are destroyed. This allows the product to keep under room temperature for a long period. The method of processing involves shredding, boiling and straining fruits.

PROCESS FLOW DIAGRAM

PROCESS

NOTES

Select

Select semi-ripe firm oranges, grape fruits and sour oranges/lemon.

Clean

Wash fruits in clean water and weigh.

Shred

Shred all the fruits thinly.

Boil

Add 5 litres (9 pints) of water to the fruits and simmer gently until shredded fruits crush when pressed between two fingers.

Strain and Pack

QUALITY CONTROL

Hygiene

Fruits should be thoroughly washed in clean water to remove dirt. When product is kept under refrigeration temperatures micro-organisms are inactivated, when chemical preservative is added it destroys microbial action which cause spoilage.

Raw Material Control

Fruits should be fresh, not bruised, fully mature and slightly ripe. Over ripeness reduces pectin content.

Process Control

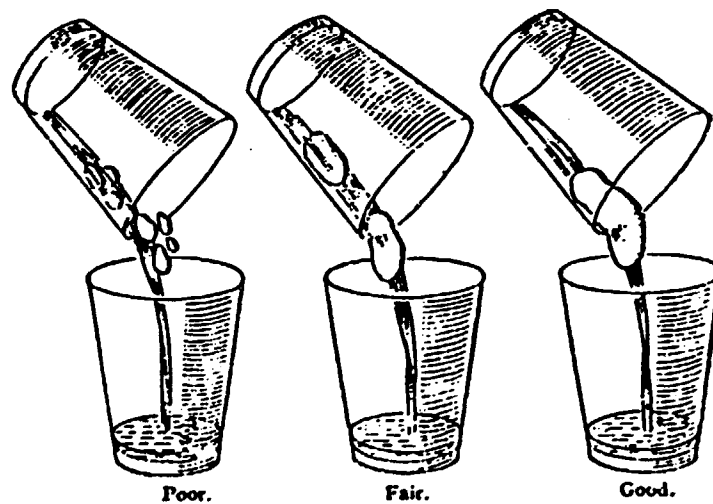
- (1) Shred fruits thinly and simmer gently to allow for optimum extraction of pectin and acid.
- (2) Leave the boiled fruits to stand for twelve hours before straining for good results.

- (3) The liquid after straining should not be more than 3.4 litres (6 pints). When it is more than 3.4 litres (6 pints) boil down. This ensures a high pectin content.

Product Control

Test for pectin content by putting 3 teaspoons full of juice into a glass and add 1 teaspoon of methylated spirit and shake. A big lump is formed if quality of pectin is high. If quality is low the mixture breaks into two or more small lumps and must be reboiled for about 3 minutes and tested again.

Fig. 1. Pectin Clots



Source: Home Preservation of Fruit and Vegetables. Ministry of Agriculture, Fisheries and Food. Reference Book 21. London.

PACKAGING AND STORAGE

Pectin can be stored in sterilized plastic or glass jars with tight lids. For large scale production add a preservative such as potassium metabisulphite and keep in a cool place. Smaller quantities can be stored in the fridge.

Equipment:

- . Boiling pan
- . Knife
- . Working table
- . Sieve
- . 2 Bowls

1.2 Jelly Marmalade

PRODUCT/PROCESS DESCRIPTION

This is a three fruit Marmalade made from oranges, grapefruits, sour oranges/lemon and sugar. Bitter varieties of oranges known as Seville oranges are normally used for marmalade. In West Africa, since this variety is not grown, a combination of citrus fruits is used.

Principles of Preservation and Method of Processing

There are two principles of preservation: The heat during boiling destroys micro-organisms and the high concentration of sugar prevents recontamination. The method of processing involves shredding and boiling fruits and adding sugar.

PROCESS FLOW DIAGRAM

PROCESS	NOTES
Select	Select mature and under-ripe fruits
Weigh/wash	Weigh one pound each of oranges, grape fruits, sour oranges/lemons and wash in clean water.
Prepare peel	Soak the grape fruits in boiling water. Cut fruits into quarters. Remove the peel.
Shred	Shred the grape fruits without peel and the rest of fruits thinly.
Boil	Add the grape fruit peels to shredded fruits. Add (9 pints) of water to the fruits and boil for 30 minutes. Remove the grapefruit peels. Continue boiling the shredded fruits until it crushes between two fingers when tested.

Prepare peel

Remove the white part of the grapefruit peel with a knife. Cut thinly. Boil peels until cooked. When cooked peels should crush between two fingers.

Strain

Strain cooked fruits.

Add Sugar

Measure the strained juice. To every .6 litres (1 pint) of juice add 454g of sugar and two table spoons of lime or lemon juice.

Boil

Dissolve the sugar thoroughly and bring to the boil.

Add Peel

As soon as the liquid begins to boil add the cut peels.

Test

Boil vigorously for ten minutes and start testing by using spoon test, plate test or a refractometer (Refer to process control).

Cool

When set remove from fire and allow to cool slightly stirring occasionally. Too much stirring disturbs setting.

Pack

Pack the marmalade hot (85°C) into a warm jar and cap it. When cool clean the jars and label. Label should state name of product other ingredients and date of production and possible date of expiration.

QUALITY CONTROL

Hygiene

- 1) Cleanliness, both personal and environmental, should be observed when processing foods.
- 2) Ensure a good balance of acid, sugar and pectin. Boil quickly to produce a well set marmalade which cannot be easily destroyed by micro-organisms.

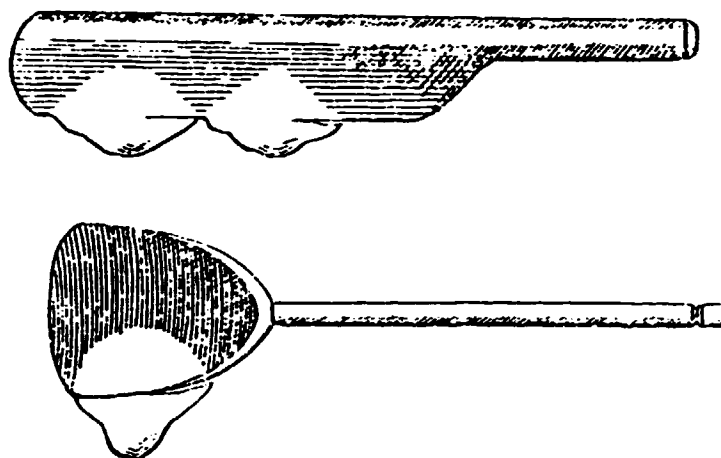
Raw Material Control

Fruits should be slightly under ripe. Over ripe fruits affects the setting quality.

Process Control

- 1) Fruits should not be boiled more than 25 minutes and not less than 10 minutes therefore boil in small quantities. Over boiling affects the colour and flavour.
- 2) There are three ways of testing the setting point. These are:
 - (a) Use of refractometer.
 - (b) Plate/wrinkle test: After ten minutes of boiling drop some marmalade on a plate and allow to cool. Push the marmalade with a finger, if it wrinkles on the plate then it is set.
 - (c) Flake test - After ten minutes of boiling dip a wooden spoon into the marmalade. Turn the spoon around to allow the marmalade to cool slightly (turn three or four times). Allow the marmalade to drop of the spoon. If the marmalade is not set it will run off, if it is set it will drop off in broad flakes and then break off short on the spoon.

Fig. 2. Flake test showing how marmalade breaks off on the spoon



Source: Home Preservation of Fruit and Vegetables. Ministry of Agriculture, Fisheries and Food. Reference Book 21. London.

Product Control

Marmalade should be bright in colour, set firm and peels evenly distributed.

PACKAGING AND STORAGE

Pour marmalade into a sterilized bowl. Allow marmalade to cool slightly (85°C) before pouring into sterilized jars otherwise the peel will float at the top. Store in a cool place.

Equipment:

- . 2 Saucepans, a sieve, a wooden spoon/ladle
- . 2 wash bowls for boiling metal
- . 2 Plates
- . 1 Table spoon, (refractometer optional)
- . All metal utensils should be made of enamel, aluminum or stainless steel metal.

1.3 Pineapple Jam

PRODUCT/PROCESS DESCRIPTION

Jam differs from Marmalade in the sense that Jam is made from 'non-citrus fruits' whilst Marmalade is made from citrus fruits. Pineapple jam is made from pineapple pulp, sugar and pectin.

Principle of Preservation and Method of Processing

Jam is preserved by heat destruction of micro-organisms during boiling and prevention of recontamination by a high concentration of sugar. The method of processing involves boiling fruit pulp with sugar and pectin.

PROCESS FLOW DIAGRAM

PROCESS	NOTES
Select	Select mature, fresh and slightly ripe pineapples.
Peel	Peel pineapples and cut into pieces which can easily be handled when grating by hand.
Grate & Weigh	Grate the pineapples using a grater (wearing gloves) and weigh the pulp.
Boil	To every 1.36kg (3lb) of pulp add 454g (1lb) pectin stock (refer to page 2), six table spoons of lime/lemon juice. Boil for 15 minutes.
Add Sugar	To every 454g (1lb) of fruit pulp add 454g (1lb) of sugar and stir until sugar dissolves.
Boil	Apply high heat and bring mixture to the boil. Start testing for setting when mixture has boiled

for ten minutes. When set remove from fire and remove any scum.

Pack

Fill hot into hot sterilized jars. Put on sterilized caps and screw tight.

QUALITY CONTROL

Hygiene

- 1) Wash fruits thoroughly to remove dirt and any foreign matter.
- 2) Jars and caps must be sterilized in boiling water for ten minutes.
- 3) The heat and high concentration of sugar controls mould growth.

Raw Material Control

- 1) To attain high quality in producing jams the fruits used must be mature and slightly under ripe.
- 2) For jam to set there should be a balance between acid, pectin and sugar.

Process Control

- 1) Pectin helps the jam to set. Many 'non-citrus fruits' lack the required concentration of acid and pectin e.g. pineapple. To make up for this, pectin made out of citrus fruits or apple is added to the pulp.
- 2) One of the important principles for producing good jam is quick boiling. The shorter the time, the clearer the colour and nicer the flavour. Jam should set within 10 - 25 minutes. Over-boiling destroys the setting quality/texture of jam.

Product Control

1. Fruits should be fresh and slightly ripe in order to set well and yield a bright clear colour.
2. There should be a perfect balance between sugar, which preserves the jam, pectin, which helps the jam to set and acid which enhances the flavour.

PACKAGING AND STORAGE

Pour hot into hot sterilized jars and put on caps. Allow to cool and store in a cool place.

Equipment:

- . Scale
- . 2 sauce pans
- . Ladle
- . Grater
- . Knife
- . Table spoon

1.4 Pineapple and Ginger Syrup

PRODUCT/PROCESS DESCRIPTION

Pineapple and ginger syrup is made from strained pineapple juice flavoured with fresh ginger juice. Fruit syrups differ from fruit squashes in that squashes have part of the fruit tissues included. Fruit syrups and squashes have both proved to be useful methods of preserving fruits and they are also used in flavouring puddings, jellies and sauces. The concentration of sugar in both drinks makes it possible to dilute 1 part syrup with about 5 parts of water or soda.

There are two methods of preparing syrups namely the cold method and the hot process. The cold method is sometimes considered to retain the fruit flavour better.

Principles of Preservation and Methods of Processing

The heat applied during processing helps to destroy micro-organisms in the juice and the sugar concentration prevents recontamination easily. The method of processing involves extracting juice, adding water and sugar and, sterilization.

PROCESS FLOW DIAGRAM

PROCESS	NOTES
Select	Select fresh under ripe pineapples
Peel	Peel very carefully removing all the "eyes"(use gloves).
Extract Juice	Cut through length wise. To every 454g (1lb) of fruit add 28.3g (1oz) cleaned and sliced ginger. Pass through juice extractor or liquidizer.

Filter

To every .6 litres (1 pint) of juice add .14 litres (1/4 pint) water and filter through a fine mesh sieve.

Add Sugar

Measure the juice and to every .6 litres (1 pint) of juice add 454g (1lb) sugar, 2 table spoons lemon or lime juice and stir until sugar dissolves.

Bottle

Syrup should be filled cool into sterilized bottles up to within one inch from the top of the cap. Use crown cork machine for capping (Refer to UNIDO Manual on Training for Entrepreneurs in Development Manual Vol. II. Chp. 3: Fig. 15)

Process

Place bottles upright in a water bath. Add cold water up to the lower level of the cork. Bring the temperature up to simmering point 82° (190°F) within 30 minutes. Maintain this temperature for 20 minutes.

Cool

Remove bottles from the water and stand them on a wooden table to cool.

QUALITY CONTROL

Hygiene

- 1) Personal and environmental cleanliness should be observed when processing.
- 2) Wash fruits thoroughly to remove dirt and other foreign matter.
- 3) Jars and caps must be sterilized in boiling water for 10 minutes.

Process Control

- 1) Add .3 litres (1/2 pint) water to .6 litres (1 pint) juice when a

liquidizing machine is used. This makes the juice light.

- 2) Ensure sterilization is complete. The temperature of the water for sterilization should be raised slowly from 0 - 82°F (190°F) or simmering point within 30 minutes and held at that temperature for 20 minutes.
- 3) The temperature should not go above 82°F (190°F) otherwise the vitamin in C in the juice will be destroyed.

Product Control

- 1) The sugar concentration in the proportion of .6 litres (1 pint) juice to 454g (1lb) sugar preserves the juice for about 9 months or more.
- 2) Keep product away from sunlight to preserve the colour of the product.

PACKAGING AND STORAGE

Store in sterilized bottles. Keep in a cool place and away from sunlight.

Equipment:

- . 1 Deep pan
- . 2 Bowls
- . Measuring cup
- . Juice extractor/Liquidizer
- . Knife
- . Sieve

1.5 Tomato Puree

PRODUCT/PROCESS DESCRIPTION

Tomato puree is a thick paste made from evaporating tomato pulp. The product is used in soups and sauces. There are three methods of preserving tomatoes and these are whole tomatoes in brine, tomato in its juice and tomato puree. Of the three methods tomato puree is considered the most economical.

Principle of Preservation and Method of Processing

The heat during processing destroys micro-organisms. The vacuum created in sealed jars/can inactivates and prevents contamination. The method of processing involves grinding, sieving and boiling tomato pulp.

PROCESS	NOTES
Select	Select fresh ripe tomatoes
Cut	Wash in clean water and cut up into pieces
Boil	Weigh the cut tomatoes and to every 454g (1lb) of tomatoes add 1/2 teaspoon salt and 1/4 teaspoon sugar. Boil for 30 minutes.
Sieve	Pass the cooked fruits through a sieve
Boil	Boil the pulp for water to evaporate until it thickens
Bottle	Fill the puree hot into hot sterilized jars. Screw caps on tightly and then unscrew

slightly to allow for air to escape when sterilizing. Place the jars into the boiling water. Remove bottles after thirty minutes. Screw caps on tightly and leave to cool.

QUALITY CONTROL

Hygiene

- 1) Discard all mouldy and rotten tomatoes. Wash fruits in clean water to remove some of the yeast and mould which are often found on the surface of fruits.
- 2) All packaging materials (glass jars/bottles, caps, rubber bands) should be washed and sterilized by boiling them in boiling water for at least 10 minutes.
- 3) Seal product properly to prevent recontamination.

Raw Material Control

- 1) Process only fresh, well ripe and firm tomatoes.
- 2) Use, if possible, fleshy varieties to give good yield.

Process Control

- 1) Tomato pulp can also be extracted by the use of a liquidizer or juice extractor.
- 2) Puree should not be too thick in order to prevent air pockets when filling jars.
- 3) Stir regularly to avoid burning.
- 4) Boil pulp till it is approximately one third of its original volume.

PACKAGING AND STORAGE

- 1) Store in glass jars/bottles or can the product.
- 2) Air bubbles must be avoided when filling.
- 3) Store in a cool place and keep away from sunlight to preserve colour.

Equipment:

- . Sauce pan
- . 2 bowls
- . Scale
- . Knife
- . Teaspoon.
- . 2 plates

FOOD GRAINS

2.1 DZOWE

PRODUCT/PROCESS DESCRIPTION

Dzowe is a product made from milled roasted maize, groundnut, sugar and spices. It is taken as a snack.

Principles of Preservation and Methods of Processing

Preservation is achieved by heat destruction of micro-organisms during roasting and a low moisture content which prevents microbial growth. The method of processing involves roasting and milling all ingredients together.

PROCESS FLOW DIAGRAM

PROCESS

NOTES

Clean

|

Roast

|

Add Spices

|

Mill

|

Pack

Discard shrivelled and mouldy nuts if any and winow to remove dust.

Roast 2 parts of maize and 1 part of groundnut separately.

Prepare and add spices: dry ginger, black pepper, red pepper, pepper corn.

Put all ingredients together with the sugar and mill.

Pack into polythene bags/air tight containers and seal.

QUALITY CONTROL

Hygiene

- 1) Both personnel and environmental cleanliness must be strictly observed when processing food.
- 2) All utensils must be kept clean.
- 3) Low moisture content prevents microbial growth.

Raw Material Control

Remove mouldy nuts and corn and any other foreign matter.

Process Control

1. Avoid over roasting the maize and groundnut in order not to destroy the flavour of the product.
2. Mill all ingredients till product is very fine.

PACKAGING AND STORAGE

Pack product in polythene bags and seal. Keep in a cool place.

Equipment:

- Roasting pan
- Scale/Measuring cup
- Bowls
- Sealing machine

2.2 Salted Groundnut

PRODUCT/PROCESS DESCRIPTION

This product is a snack or savoury prepared by parboiling groundnut in salt water, drying and roasting.

Principles of Preservation and Methods of Processing

Two principles involved: The heat during parboiling and roasting destroys micro-organisms and the low moisture content prevents recontamination. The method of preservation involves parboiling, drying and roasting of groundnut.

PROCESS FLOW DIAGRAM

<u>PROCESS</u>	<u>NOTES</u>
Clean	Remove mouldy and shrivelled nuts. Winnow to remove dirt.
Prepare solution	For every 454g (1lb) of groundnut take 1litre (2 pints) water and 85g (3oz) salt.
Boil	Add salt solution to groundnut and boil for 3 minutes.
Dry	Drain and dry groundnut.
Roast	Roast until cooked.
Pack	Cool and pack in polythene bags or air tight containers.

QUALITY CONTROL

Hygiene

Most micro-organisms are destroyed through the heat processing. Observe personal and environmental hygiene during processing.

Raw Material Control

Remove spoilt groundnut and other foreign matter.

Process Control

- 1) Nuts are not to be over boiled.
- 2) Dry nuts thoroughly before roasting to ensure a crisp product.
- 3) Avoid over-roasting nut as this affects the colour and flavour of the product.

PACKAGING AND STORAGE

Cool and pack groundnut in polythene bags or air tight containers. Store in a cool place.

Equipment:

- . Pan for boiling
- . Strainer
- . Pan for roasting
- . Ladle for stirring
- . Solar dryer/table for drying

2.3 Atififi

PRODUCT/PROCESS DESCRIPTION

Atififi is a snack made from corn dough. It is sweetened with sugar, flavoured with spices and fried. It has a shelf life of approximately eight weeks if well fried and kept in an air tight container.

Principles of Preservation and Methods of Processing

Two principles are involved. The destruction of micro-organisms by heat during frying and the prevention of recontamination as a result of a low moisture content. Processing involves milling maize, preparing dough, rolling dough and frying.

PROCESS FLOW DIAGRAM

<u>PROCESS</u>	<u>NOTES</u>
Clean	Remove chaff and any dirt by winnowing.
Mill	Mill corn with condiments (Ethiopian pepper, ginger, <u>Piper guineense</u> (local name: Sro wisa)).
Prepare Dough	Cook two thirds of the meal into a batter. Allow the batter to cool. Mix in the rest of the corn meal. Add sugar and salt to taste.
Roll	Roll dough into thin strips of approximately four inches long and a quarter inch thick.
Fry	Fry in moderately hot oil until golden brown.
Pack	Cool and pack.

QUALITY CONTROL

Hygiene

Both personal and environmental hygiene should be observed. The heat and low moisture content prevents/reduces microbial action.

Raw Material Control

Remove chaff, weevils and any other foreign matter.

Process Control

- 1) Dough must not be too soft in order to obtain a dry product.
- 2) Strips should be uniform to ensure even cooking.
- 3) Oil should not be very hot in order to ensure that product is thoroughly cooked.
- 4) The product should be fried slowly to ensure it is thoroughly cooked.

Product Control

The product will keep for at least eight weeks if packed in moisture-proof bags or air tight containers and kept in a cool place.

PACKAGING AND STORAGE

Product should cool thoroughly before packing into moisture proof bags and sealed. Air tight containers can also be used. Keep in a cool place.

Equipment:

- . 2 Bowls
- . Saucepan
- . Wooden ladle
- . Flying pan
- . Draining basket/sieve

ROOT-GRAIN

3.1 Fortified Gari

PRODUCT/PROCESS DESCRIPTION

Gari is a dry starchy product made from cassava dough. To improve its nutritional content soya flour is added in the proportion of 1 part soya flour to 4 parts cassava dough before pulverising the dough for roasting. This product can be taken as a snack or part of a main meal.

Principles of Preservation and Methods of Processing

The heat during roasting destroys micro-organisms and the low moisture content prevents microbial growth. The method of processing involves grating cassava, extracting water, milling soya beans and roasting pulverized product.

PROCESS FLOW DIAGRAM

PROCESS (Soya bean)

NOTES

Clean

Remove all foreign matter from the soya beans and winnow to remove any dirt.

Blanch

Blanch in boiling water for 30 minutes

Dehaul and Mill

Dehaul and mill soya beans

Add to Cassava Dough

To every 1.36kg (3lbs) of cassava dough add 1lb of soya paste

PROCESS (Cassava)

NOTES

Select

Select fresh cassava.

Peel

Peel and wash cassava in clean water to remove dirt.

Grate

Grate cassava by hand or mill in a machine.

Prepare Dough

To every 22.7kg (50lb) of grated cassava dough take 2.84l (5pints) water and 340g (12oz.) salt. Dissolve salt in water and add to the dough.

Extract Juice

Pack dough into jute size bags and put a stone/weight on. Juice can also be extracted by using a machine press.

Ferment

Leave for two days to ferment.

Roast

To every 1.36kg (3lbs) of cassava dough add 454g (1lb) freshly milled soya paste. Sieve and roast.

Pack

Cool and pack into polythene bags.

QUALITY CONTROL

Hygiene

The heat during processing destroys micro-organisms and the low moisture content of the product prevents contamination. Personal and environmental hygiene should be observed when processing.

Raw Material Control

- 1) After peeling cassava wash thoroughly in clean water to remove all dirt.
- 2) Remove all foreign matter from soya beans.

Process Control

Gari must be roasted until crisp.

Product Control

To prolong the shelf life, roast until crisp and keep in sealed bags or in air tight containers. Well roasted and properly kept gari will keep for more than one year.

PACKAGING AND STORAGE

Pack in polythene bags and seal or in air tight containers. Keep in a cool place.

Equipment:

- . Grater
- . Sieve
- . Roasting pan
- . Piece of calabash for roasting

STARCH PRODUCT

4.1 Starch Biscuit

PRODUCT/PROCESS DESCRIPTION

Starch biscuit is made from starch, coconut milk and sweetened with sugar.

Principles of Preservation and Methods of Processing

The heat during baking destroys micro-organisms. The low moisture content prevents microbial action. The method of processing involves extracting coconut milk, mixing starch with milk and baking.

PROCESS FLOW DIAGRAM

PROCESS

NOTES

Clean

Add water to starch mix thoroughly and strain through muslin to remove foreign particles.

Dry

Leave the starch solution to settle. Pour water off and dry starch.

Prepare milk

Grate one medium size coconut. Add about three tablespoons water. Extract the milk using muslin. Dissolve sugar in milk.

Prepare Dough

Sieve the starch and mix with the coconut milk into a semi stiff dough.

Age

Leave for 30 minutes to age.

Shape

Make dough into small balls. Place on a baking sheet and flatten. Decorate if desired.

Bake

Bake in a moderately hot oven until light brown.

QUALITY CONTROL

Hygiene

Micro-organisms are destroyed by heat and the low moisture content prevents recontamination.

Raw Material Control

- 1) Starch should be fresh.
- 2) Mix starch with a lot of water and strain to remove foreign particles.

Process Control

- 1) Dough should not be too soft.
- 2) Oven should not be very hot.

PACKAGING AND STORAGE

Product should be stored in air tight containers or moisture proof bags and sealed. Keep in a cool place.

Equipment:

- . Grater
- . Muslin
- . 2 bowls
- . Spoon
- . Biscuit Decorator

SPICES

5.0 Shitor: Dry Fish/Pepper Sauce

PRODUCT/PROCESS DESCRIPTION

Shitor is a seasoned pepper sauce made from red hot pepper, dried fish and shrimps, onions, tomatoes and spices. All the ingredients are cooked in oil until water evaporates.

Principles of Preservation and Methods of Processing

The heat applied during cooking destroys all micro-organisms. The absence of water prevents rancidity and recontamination. The method of processing involves pounding/milling pepper, fish powder and shrimps; grinding onion and ginger and frying.

PROCESS FLOW DIAGRAM

PROCESS

NOTES

Prepare Ingredients

Remove scales, head and entrails of smoked fish. Remove parts of shrimps which is likely to contain sand/stone. Clean 3 medium size onions and small piece of ginger. Grind ginger, onion and other condiments separately.

Cook

Put 1 liter of oil on fire and add the ground onions. Allow to cook until on light brown. Add 140g tomatoes, ginger and pepper and allow to simmer for approximately 25 minutes. Add 100g powdered fish, 50g shrimps and condiments. Allow to simmer until water evaporates.

Pack

Fill hot sauce into sterilized jars/wide mouth bottles. Allow to cool and cap tightly. Keep in a cool place.

QUALITY CONTROL

Hygiene

- 1) The heat applied during boiling destroys micro-organisms in the raw material. The low content of water prevents microbial action.
- 2) Personal and environmental hygiene should be observed during processing.
- 3) Keep all utensils and machine clean.

Raw Material Control

- 1) Fish and shrimps should taste fresh.
- 2) Fresh ingredients can be used but for a shorter cooking time use smoke dried fish and shrimps, dry pepper and tomato puree.
- 3) Discard all parts of fish and shrimps that contain stone/sand.

Process Control

- 1) Fish, shrimps and pepper can be pounded or milled.
- 2) Regular stirring prevents burning.
- 3) Ensure no water is left in the sauce.

Product Control

The lower the moisture content, the more prolonged the shelf life. Product with a very low moisture content can keep for over 6months.

PACKAGING AND STORAGE

Store in air tight containers. Pack hot and allow to cool before tightening cap/cover. Keep in a cool place.

Equipment:

- . Saucepan
- . Ladle
- . Mortar and pestle or mill