

BEERS from sorghum,millet or rice, **BANANA
BEER, BAMBOO WINE, TOGWA**

11.1 Beer

PRODUCT/PROCESS DESCRIPTION

Beer is a fermented beverage, which is made from sorghum, finger millet or rice. The colour of the product varies from whitish (rice beer) to reddish brown (sorghum and millet beer). The flavour reflects the raw material used and has a sweet, alcoholic taste. The shelf life of the product is relatively short at up to two weeks as it is not usually pasteurised after fermentation. It is possible to extend the shelf life to several months by bottling and pasteurisation.

Principles of Preservation and Method of Processing

Preservation is achieved by inactivation of enzymes and contaminating micro-organisms during boiling and by the relatively high levels of alcohol which inhibit the growth of many spoilage micro-organisms. The process involves preparation of the malted grain 'mash' and fermentation by yeasts to produce the alcohol.

PROCESS FLOW DIAGRAM

PROCESS	NOTES
Dried Grains	Sorghum, finger millet, rice.
Winnow	Husks and dust removed using a winnowing basket.
Wash	Washing removes adhered soils.
Germinate	For rice beer, paddy is used for germination to produce malt.
Dry	Sun drying 1-2 days.
Grind	Grinding should give fine flour to pass through 1 mm sieve. Grind by hand or powered milling machines.
Mix	Add malted flour.
Heat	Boil for 3-5 hours.
Cool	Cooling is important because starter (yeast) cannot act at high temperatures. Room temperature is recommended.
Mix	Add starter (2-10% by weight).
Ferment	Fermentation time depends on climate and type of starter and cereal. In hot climate 1-2 days, but in cold climate more than 3 days.

Filter

Filter to remove solids and produce a clear product.

Pack

Pack in gourds, bottles etc.

Store

Store in a cool place out of sunlight.

QUALITY CONTROL

Hygiene

Although the raw materials are sterilised by boiling, the wort is an excellent substrate for microbial growth. It is therefore essential that all equipment is thoroughly sterilised to prevent contaminating bacteria from competing with the added yeast and producing acid instead of alcohol. This can be done by cleaning with boiling water or with chlorine solution. Care is necessary to wash the equipment free of residual chlorine as this would interfere with the actions of the yeast.

Raw Material Control

Grains should be harvested when fully mature to maximise the carbohydrate content, and properly germinated (Chapter 4.1) to maximise amylase activity. Dried grains should be properly stored to prevent moisture pickup which would allow mould growth and reduce amylase activity.

Process Control

The main control points are:

- 1) correct germination of grains and thorough drying (see Chapter 4.1 Cereal Products),
- 2) proper grinding of the cereals to increase the surface area and maximise amylase activity,
- 3) adequate time and temperature of boiling to hydrolyse carbohydrates to sugars and thus make them more available for yeast action,
- 4) preparation of an active yeast inoculum and addition of the correct amount to the wort,
- 5) cooling the wort to an optimum temperature for yeast action. Too low and the fermentation time is extended and may spoil before the alcohol level is increased, too high and the yeast would be destroyed,
- 6) proper filtration to produce a clear product.

Product Control

The main quality factors are colour, flavour and clarity of the beer. The colour and flavour are determined mostly by the extent of boiling of the mash and the flavour is also determined by the extent of yeast activity. The clarity of the final product is determined by the success of filtration.

PACKAGING AND STORAGE

Packaging is usually only required to contain the product for the relatively short shelf life and to prevent contamination by dust, insects etc. Cleaned glass or plastic bottles, gourds etc. are sufficient. For a longer shelf life it may be possible to pasteurise the bottled beer using the techniques and equipment described for fruit juices (Chapter 3). The product should be stored in a cool place away from direct sunlight.

Equipment:

- No special equipment is required.

11.2 Lubisi (Banana Beer)

PRODUCT/PROCESS DESCRIPTION

Lubisi is made from bananas of the Jamaican variety, mixed with sorghum flour and fermented to an orange, alcoholic beverage. It is sweet and slightly hazy with a shelf life of several days under correct storage conditions.

Principles of Preservation and Method of Processing

Preservation is achieved by inactivation of enzymes and contaminating micro-organisms during boiling and by the relatively high levels of alcohol which inhibit the growth of many spoilage micro-organisms. The process involves preparation of the banana juice, mixing with sorghum flour and fermentation by yeasts to produce the alcohol.

PROCESS FLOW DIAGRAM

PROCESS	NOTES
Ripe Banana	
↓	
Peel	Peel by hand, if peels are not easily removed then the banana is not ripe enough.
↓	
Extract → residue	Use grass to knead or squeeze the banana such that only clear juice is obtained. Residue will remain in the grasses.
↓	
Mix ← water	Mix 1:3 water : banana juice ratio. To make the total soluble solids low enough for the yeast to act.
↓	
Mix ← sorghum	Sorghum flour : banana juice ratio, 1:12. Stir the mixture well. Sorghum is used to improve flavour and color of the beer.
↓	
Ferment	Ferment in plastic container, covered by polythene bags or flat wood pushed down by heavy stone. Leave to ferment for 18-24 hours.
↓	
Filter	Filter the liquid by putting in a cotton cloth bag and squeeze by hand or in a press.
↓	
Pack	Package in 1 litre plastic bottles.
↓	
Store	Store in cool place away from sunlight.

QUALITY CONTROL

Hygiene

The raw materials are not sterilised by boiling and the wort is therefore an excellent substrate for microbial growth. It is therefore essential that proper hygienic procedures are followed and that all equipment is thoroughly sterilised to prevent contaminating bacteria from competing with the yeast and producing acid instead of alcohol. This can be done by cleaning with boiling water or with chlorine solution. Care is necessary to wash the equipment free of residual chlorine as this would interfere with the actions of the yeast.

Raw Material Control

Bananas should be harvested when fully ripe, to maximise the sugar content and flavour. Over-ripe bananas should not be used as they may impart off-flavours to the final product.

Process Control

The main control points are:

- 1) proper grinding of the cereals to increase the surface area and maximise amylase activity,
- 2) extraction of a high yield of banana juice without excessive browning or contamination by spoilage micro-organisms,
- 3) proper filtration to produce a clear product.

Product Control

The main quality factors are colour, flavour and clarity of the beer. The colour and flavour are determined mostly by the preparation of the banana/sorghum mixture. The clarity of the final product is determined by the success of filtration.

PACKAGING AND STORAGE

Packaging is usually only required to contain the product for the relatively short shelf life and to prevent contamination by dust, insects etc. Cleaned glass or plastic bottles, gourds etc. are sufficient. The product should be stored in a cool place away from direct sunlight.

Equipment:

- No special equipment is required.

11.3 Ulanzi (Bamboo Wine)

PRODUCT/PROCESS DESCRIPTION

Ulanzi is either fermented or unfermented (sweet ulanzi) bamboo sap, obtained by tapping young bamboo shoots during the rainy season. It is a clear, whitish beverage with a sweet/alcoholic taste and a shelf life of several days under correct storage conditions.

Principles of Preservation and Method of Processing

Preservation is achieved by the relatively high levels of alcohol which inhibit the growth of many spoilage micro-organisms. In some cases the product is pasteurised in bottles to destroy enzymes and contaminating micro-organisms and therefore increase the shelf life to several weeks. The process involves extraction of the bamboo sap and a natural fermentation by yeasts to produce the alcohol.

PROCESS FLOW DIAGRAM

PROCESS	NOTES
Growing bamboo shoots	
Select Shoots	Choose 1 m tall bamboo shoots.
Cut	Cut 10-15 cm for the top.
Tap	A tapping tumbler can be made using the same bamboo. Remove the tapping top by knife every day by cutting a 3 mm slice off. The sap produces sweet ulanzi.
Mature	Ulanzi is made by aging in which alcohol is produced. It is usually done for 5-12 hours.
Pack	Use glass containers as ulanzi is corrosive to metal containers.
Pasteurise	Heat at 64° C - 72° C for 15 minutes.
Cool	Cool to room temperature.
Store	Store in a cool, dark place.

QUALITY CONTROL

Hygiene

The raw materials are not sterilised by boiling and the wort is an excellent substrate for microbial growth. It is therefore essential that proper hygienic procedures are followed and that all equipment is thoroughly sterilised to prevent contaminating bacteria from competing with the yeast and producing acid instead of alcohol. This can be done by cleaning with boiling water or with chlorine solution. Care is necessary to wash the equipment free of residual chlorine as this would interfere with the actions of the yeast.

Raw Material Control

Bamboo shoots should be young to achieve a high yield of sap. The growing tip is removed and a container fixed in place to collect the sap. The container should be clean to prevent contamination of the fresh sap which would impart off-flavours to the final product.

Process Control

The main control points are

- 1) extraction of a high yield of bamboo sap without excessive contamination by spoilage micro-organisms,
- 2) correct time and temperature to allow the natural fermentation to take place,
- 3) if pasteurised, the correct time and temperature to inactivate enzymes and yeast.

Product Control

The main quality factors are colour, flavour and clarity of the wine. These are determined mostly by the conditions used in collection of the sap and the extent of fermentation.

PACKAGING AND STORAGE

Packaging is usually only required to contain the product for the relatively short shelf life and to prevent contamination by dust, insects etc. Cleaned glass or plastic bottles, gourds etc. are sufficient. For a longer shelf life it is possible to pasteurise the bottled wine using the techniques and equipment described for fruit juices (Chapter 3). The product should be stored in a cool place away from direct sunlight.

Equipment:

No special equipment is required (for the pasteurised product, see Chapter 3).

11.4 Togwa

PRODUCT/PROCESS DESCRIPTION

Togwa is a non-alcoholic beverage which is used as a refreshing, energy rich drink. It is made from sorghum, millet or rice and the colour of the product is determined by the raw materials used. All are slightly hazy, sweeter and more viscous than beer. Togwa has little or no alcohol to inhibit microbial growth during storage and the shelf life is therefore only a few days under proper storage conditions.

Principles of Preservation and Method of Processing

Preservation is achieved by destruction of enzymes and contaminating micro-organisms by heat during boiling.

PROCESS FLOW DIAGRAM

PROCESS	NOTES
Dried Grains	
Winnow	Husk, dust, light grains and light parts are removed using a winnowing basket.
Wash	Wash thoroughly using cold water.
Dry	Sun drying for 10-12 hours.
Germinate	Germination is done in darkness; banana leaves, or large sheet of cloth can be used to cover grains.
Grind	Grind to a fine flour to pass 1 mm sieve. Grinding can be done by hand or powered mill.
Dry	Dry to a dry flour 2-5 hours in the sun.
Heat	Boil for 30 minutes to produce gruel.
Cool	Stirring is important to assist cooling and avoid hard top layer formation.
Heat	Heating should be done steadily to just below boiling to give time for the analyse to act.
Mature	Leave overnight to mature.
Filter	Filter through clean cloth.
Pack	Pack in plastic container (1 ltr).

QUALITY CONTROL

Hygiene

Although the raw materials are sterilised by boiling, the wort is an excellent substrate for microbial growth. It is therefore essential that all equipment is thoroughly sterilised to prevent contaminating bacteria from spoiling the Togwa after it has been boiled. This can be done by cleaning with boiling water or with chlorine solution.

Raw Material Control

Grains should be harvested when fully mature to maximise the carbohydrate content, and properly germinated (Section 4.1) to maximise amylase activity. Dried grains should be properly stored to prevent moisture pickup which would allow mould growth and reduce amylase activity.

Process Control

The main control points are:

- 1) correct germination of grains and thorough drying,
- 2) proper grinding of the cereals to increase the surface area and maximise amylase activity,
- 3) adequate time and temperature of boiling to hydrolyse carbohydrates to sugars.

Product Control

The main quality factors are colour, flavour and clarity of the beer. The colour and flavour are determined mostly by the extent of boiling of the mash. The clarity of the final product is determined by the success of filtration.

PACKAGING AND STORAGE

Packaging is only required to contain the product for the relatively short shelf life and to prevent contamination by dust, insects etc. Cleaned glass or plastic bottles, gourds etc. are sufficient. The product should be stored in a cool place away from direct sunlight.

Equipment:

- No special equipment is required.