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Text and pictures by Mr. Eric W. Ampadu,
Executive Secretary of FPMAG
E-Mail: business@fpmag.org
Postal address: P. O. Box 1833, Accra, Ghana
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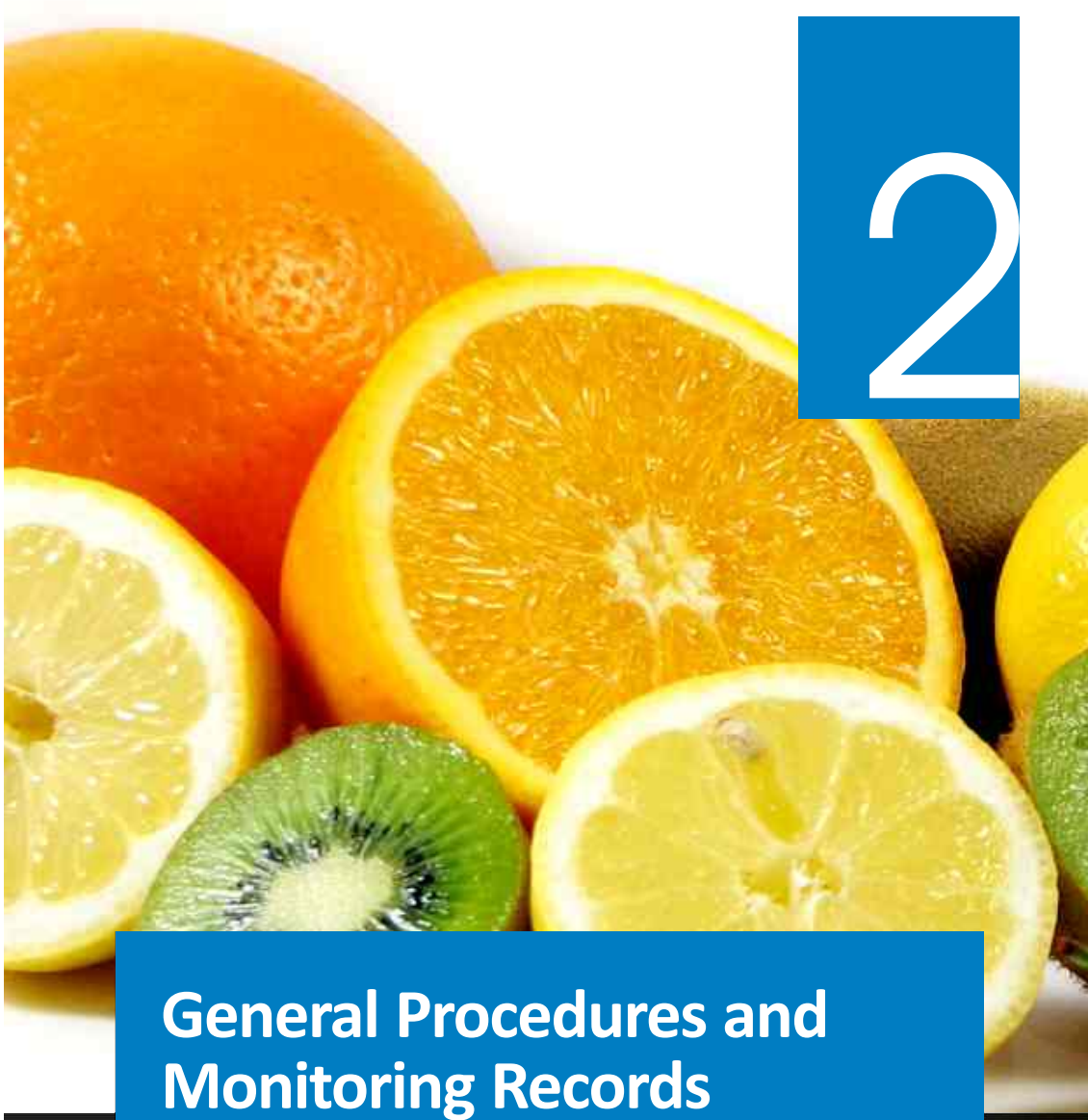

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General Procedures and Monitoring Records

For Fruit Juice Processing

Manual Two

Fruit Processors & Marketers Association of Ghana

Preface

This Manual 2 follows Manual 1 "Food Safety Standards for FPMAG Members" which deals with the physical infrastructure and the operational standards required in the fruit processing factory setup to ensure good manufacturing practices and especially good hygienic practices.

This manual (Part Two) guides members get their operations right. The manual therefore covers the main procedures in fruit juice processing. It also includes monitoring records as well as an introduction to Food Safety Management Systems (HACCP, i.e. Hazard Analysis and Critical Control Points).

Record Sheet: Supply to customer

Date	Product produced	Batch number	Number of crates	Customer name	Customer contact

Record Sheet: Finished product

Quantitative analysis before sending to storage

Date	Product produced	Batch number	Number of bottles	Number of rejects	Number of acceptable bottles

Contents

Contents

Record Sheet: Cleaning

Date	Type of activity	Area cleaned	Chemicals used	Name of staff & signature	Name of supervisor & signature

Record Sheet: Pest control

Date	Name of agent	EPA cert. no.	Chemical and concentration used	Area of control	Pests targeted	Date of next measure	Signature

Raw material supply

Raw material available in Ghana

Common fruits for juicing are:

- **Pineapple**
- **Orange**
- **Mango**
- **Water melon**
- **Lemon / Lime**
- **Cashew Apple**
- **Passion fruit which is fast gaining attention in Ghana.**

The major raw material for juice processing in Ghana is the pineapple fruit. The popular varieties are:

- MD2
- Smooth Cayenne
- Sugar Loaf

Supply chain management

Fruit processors should consider the following in their supply chain management:

- Who will be my fruit supplier: FBOs, farms or fruit supply agents?
- Do they have the desired variety?
- Who does the transporting? What is the mode of transportation: Crates or bulk?
- What is the time between harvest and delivery to my factory?

Agreement with Fruit Suppliers

It is advisable that processors rely on more than two suppliers to ensure regular supply of fruits.

It is also important that fruit juice processors institute a fruit quality specification with fruit suppliers. The agreement should specify the following:

- Fruits variety required
- Level of maturity
- Minimum Brix required (sugar-acid ratio)
- Maximum pesticide residue level
- Mode of Delivery: Use Just In Time Delivery
  (Request only quantities required for specified production days to reduce waste. Fruits are perishables!)
- Mode of payment for quantities delivered

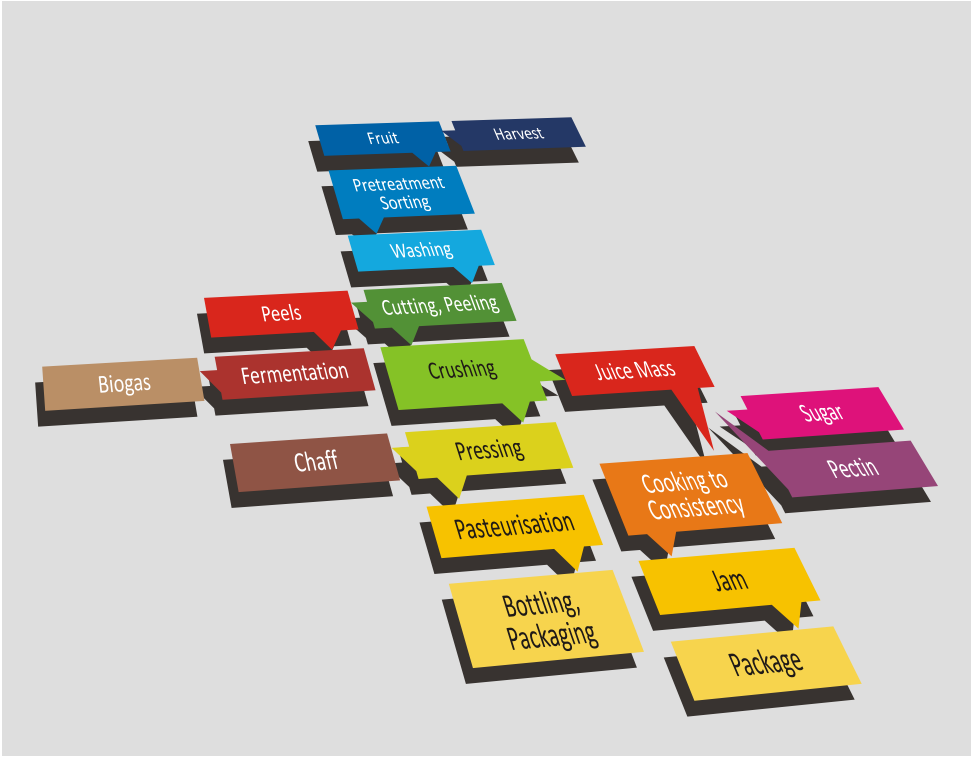
Record Sheet: Production control

Date	Product produced	Quantity of fruits IN	Weight (kg) of fruits IN	Weight (kg) of product OUT	Ratio IN to OUT	Number of crates OUT	Batch number	Number of workers	Hours needed

Record Sheet: Production book

Date	Product Produced	Number of bottles	Number of crates	Batch number	Signature

Process Flow



The main processing stages in juice processing are:

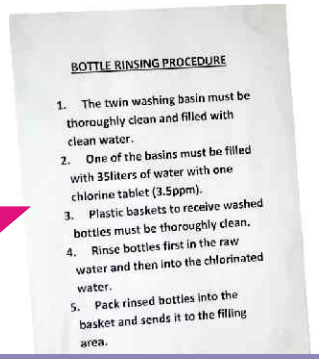
- Selection, purchase and delivery of raw materials
- Sorting
- Washing
- Peeling
- Coring, removal of fruit stone/seed

- Cutting of fruit
- Crushing and pressing
- Filtration
- Pasteurisation
- Filling / Bottling
- Labelling and Packaging

Standard Operating Procedure (SOP)

SOP indicates a sequential approach to execute an activity with a constant result e.g. pasteurisation or washing of bottles. SOP should be simple to follow, use simple language and should be checked and approved by an authorising supervisor.

Example
Standard Operating Procedure



BOTTLE RINSING PROCEDURE

1. The twin washing basin must be thoroughly clean and filled with clean water.
2. One of the basins must be filled with 35liters of water with one chlorine tablet (3.5ppm).
3. Plastic baskets to receive washed bottles must be thoroughly clean.
4. Rinse bottles first in the raw water and then into the chlorinated water.
5. Pack rinsed bottles into the basket and sends it to the filling area.

SOP: Fruit reception

1. Record details of the delivery van (registration number, make) and time of delivery.
2. The production manager and purchasing Officer Check and record the quantity of fruits, type, sizes, Brix. level.
3. Confirm quantity requested with order.

Record Sheet: Empty bottles

Date	Quantity (crates) IN	Quantity (crates) Washed	Quantity (crates) Damaged	Quantity (crates) OUT	Balance In Store	Name of staff member	Signature

Record Sheet: Materials stock

(separately for labels, corks, bottles, chlorine tablets)

Date	Product name and code	Quantity IN	Quantity OUT	Balance	Name of staff member	Signature

4. Quantity check has to be done under the supervision of the supervisor and the supplier.
5. The supplier should then confirm and sign delivery records.
6. Any defective product should be rejected and returned immediately
7. If the consignment is acceptable the supplier is given acceptance note.

SOP: Receiving items in the factory

1. Receiving personnel or supervisor checks the supplier's details and specification and confirms with certificate of conformance both in quantity and quality.
2. Certificate of acceptance is then issued.

SOP: Raw material selection

Selection of raw material should be based on the following quality characteristics:

1. The cultivar type i.e. MD2, Smooth Cayenne, Sugar Loaf.
2. Sensory appeal characteristics such as colour, taste, aroma, size and uniform shape
3. Appearance: Absence of bruises and signs of disease
4. Stage of maturity (measured by the Brix - the sugar/acid ratio)
   - Smooth Cayenne: 9-12 Brix
   - Sugar Loaf: 13-17 Brix
   - MD 2: 9-12 Brix
5. The Selection rule is: **Fully matured and ripe but not overripe**. Overripe fruit are more prone to microbial spoilage and aroma changes.

Sorting and decrowning of fruits:

Sorting: Sorting and washing is important for juice quality and safety issues. Sorting speeds up subsequent operations.

1. Identify the cultivar or variety
2. Sort out spoilt fruit
3. Sort out fruits into desired batches of fruits depending on capacity of plant
4. Decrown by cutting or breaking off the crowns of the fruits either with knives or by hand

SOP: Washing

1. Fruit is washed in chlorinated water (10-20ppm of available chlorine) to remove soil, microorganisms and pesticide residues.
2. A second wash is done in potable water (1-2 ppm available chlorine for 5 minutes while brushing.
3. Then wash fruits in potable water with chlorine tabs (1 tab per 50 litres of water) in a bath while brushing.

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Record Sheet:
Fruit reception Quantitative analysis

Date	Batch number of fruit received	Soluble solids	pH	Degree of maturity	Signature

Record Sheet:
Fruit reception Quantitative analysis

Date	Batch number of fruit received	Variety	Supplier	Vehicle number	Gross weight (kg)	Weight of crates (kg)	Net weight (kg)	Receiving person
Total								

4 Wash water must be changed often if microbial load is to be reduced considerably.

SOP: Peeling, trimming, cutting

This aims at removing the parts of the fruit which are not edible or difficult to digest.

1 Peel fruits with sharp, clean stainless knives on stainless surfaces.

2 Cut the fruits into slices.

SOP: Juice extraction

The method or procedure of extraction depends on type of fruit.

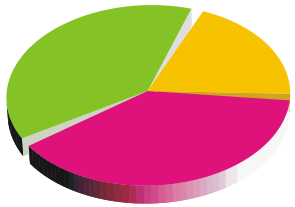
- For citrus fruits with a firm inedible skin the general process is reaming and pressing the flesh.
- For mango the process is peeling plus pulping the flesh.
- For pineapple it is hand peeling, crushing and pressing.

Monitoring, records and documentation

Records are very essential for product quality conformance, process control and for monitoring and evaluation.

The rule is: "If it has not been written, then it has not been done."

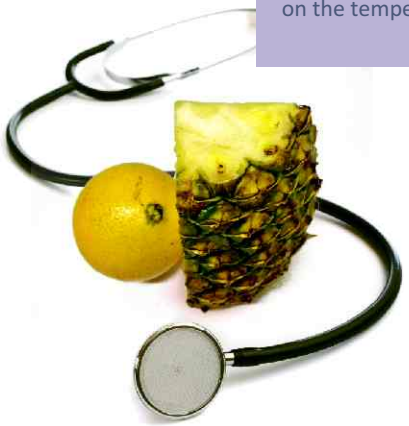
- Record Sheet: Fruit reception Quantitative analysis
- Record Sheet: Materials stock (separately for labels, corks, bottles, chlorine tablets)
- Record Sheet: Empty bottles
- Record Sheet: Production book
- Record Sheet: Production control
- Record Sheet: Pest control
- Record Sheet: Cleaning
- Record Sheet: Finished product Quantitative analysis
- Record Sheet: Finished product Qualitative analysis
- Record Sheet: Supply to customer



Establish documentation and records

Records must be kept to demonstrate the HACCP system is working under control and corrective action is taken for any breached critical limits

Example: Records to be kept include records on critical limits control, corrective actions, monitoring (cf. HACCP Manual). Also keep records on the temperature / time data and all calibration data.



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Juice extraction process (crushing and pressing):

1. Wash extractor, crusher, presser, pressing cloth and racks with a brush in detergent solution thoroughly.
2. Open the crusher by loosening knots and bolt and wash the interior surface with brush and hot water to remove all debris and plant parts.
3. Rinse thoroughly in hot water to remove all dirt and detergent.
4. Feed the crusher with the product and crush slices and discard the first part.
5. Feed the cut fruit into the crusher and collect into clean containers.
6. Avoid jamming the machine with the fruit.
7. Wash the equipment thoroughly after use.

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SOP: Pasteurisation, filling and capping

Pasteurisation

1. Wash boiler with its lid and the stirrer in detergent solution and rinse well. Cover the boiler with the lid firmly.
2. Pour juice into boiler and heat
3. Monitor the pasteurisation temperature with the sterilised hand thermometer provided: **Record temperature at 2 minutes intervals.**
4. Heat juice to a temperature of 95 C; Hold at 95ºC for 10 minutes and fill into clean bottles.
5. Maintain temperature at 90-92ºC during filling.

Filling into Glass Bottles:

1. Rinse previously washed bottles in clean portable water.
2. Immerse bottles in warm water (60-70ºC) for about 10 minutes or sterilise in chlorinated water (10-20 ppm available chlorine.
3. Remove, drain and invert bottles (neck down) into a clean container for filling.
4. Place crown corks in portable warm water (70ºC) before use.
5. Fill bottles to the brim.
6. Cover bottle with crown cork and cork immediately with the capper.
7. Place corked bottle horizontally on a flat surface for about 5 minutes to sterilise the corks.
8. Allow to cool, wash and arrange into a clean crate.

Example: Monitoring of temperature during Pasteurisation.
Recording: Keep temperature-time records
Frequency: Every 2 minutes
Responsibility: Production Supervisor

Establish corrective action for when a CCP is not under control

These are predetermined activities that are taken when CCP monitoring results indicate that a deviation has occurred and there is the potential that unsafe food has been, or will be, produced. For each CCP there must be planned, written corrective actions. The objectives of taking corrective actions are to regain control of the hazard, to determine the disposition of the affected product and to prevent a reoccurrence of the problem.

Example: For Pasteurisation check heat. If heat is incorrect, stop the process, reset the temperature, isolate that batch of products, rework the batch or discard the entire batch.

Establish procedures for verification to confirm HACCP is working

These are all methods, procedures, tests and other evaluations, in addition to monitoring, to determine conformance with the HACCP plan.

Example: Daily, the HACCP Coordinator must review all monitoring records to confirm all critical limits were met and recorded.
Once a Monthly: The HACCP Coordinator will perform onsite assessment to confirm the monitoring procedure is being performed as written.
On a quarterly basis juice samples will be subjected to microbiological laboratory analysis to confirm hazard control.
All verification activities are recorded in the production verification record with date, time and verifier initials.

as proper inspection procedures. Another hazard would be the contamination of fruit juice by pathogenic micro-organisms (due to improper Pasteurisation, i.e. improper temperature distribution and improper calibration). Control measures include appropriate equipment design and construction as well as good calibration monitoring.

Determine the Critical Control Points (CCPs)

A CCP is a point, step or procedure in a food manufacturing process at which a control measure can be applied and is essential to reduce a food safety hazard to an acceptable level.

Example: A Critical Control Point (CCP) in the Fruit Juice Processing would be the Pasteurisation (Heating or cooking) step.
The step is critical because its control is critical to food safety. The possible hazard is pathogen survival in the product due to inappropriate cooking temperature.

Establish Critical Limits

At each CCP a measurable critical limit describes the difference between what is safe and what is not.

Example: In Pasteurisation the Critical Limit is 95 C ± 1 C holding for minimum 10 minutes.

Establish a system to monitor control of the CCPs

For each CCP, monitoring procedures must be implemented and documented to ensure that the critical limit is being met. Monitoring actions, frequency and responsibility should be specified.

SOP: Bottle treatment, wash of bottles

1. Sort to select bottles in good conditions: Look out for cracked bottles, stained, bad odour and glass bottles with rough mouth edges.
2. Soak empty bottles in detergent solution overnight for at least 4 hours to soften labels and to remove any foreign materials in bottles.
3. Clean thoroughly the exterior of bottles to remove labels.
4. Use the long bottlebrush to clean thoroughly the interior of the bottles.

5. Rinse with portable water. Repeat rinsing twice.
6. Invert washed bottles in bottle racks to dry.
7. Arrange bottle in clean crates and cover with clean cloth or polythene to reduce contamination.

SOP: Finished product inspection

- Inspect every finished product coming out of production.
- Assign one production staff to inspect every bottle on line for cracks, particles or unwanted material.
- Remove any bottle with any “suspicious material”.
- Quarantine all finished product for at least eighteen (18) hours before labelling and dispatching to the warehouse.
- Spoilage can be detected by changes in colour and bloating or foaming
- Discard all bad product.

SOP: Labelling

1. Check label for clarity. Reject damaged, or defaced labels.
2. Indicate Batch no.
3. Mark expiry date with ink (shade expiry).
5. Allow to dry before packing into crates.
6. Fix label in appropriate position on bottle.(at least 1.5cm from bottom of bottle.
7. Allow to dry before packing into crates.
8. Pack into crates or paper cartons.

Ensuring food safety through HACCP

HACCP is a method of ensuring food safety by examining every step in a food operation, identifying those steps critical to food safety and implementing effective control and monitoring procedures at these steps. The seven HACCP principles:

Food Safety and the Seven Principles of HACCP

The theory of food safety is based on the desire to keep food safe from contamination of any kind. Microbial contamination is especially important because bacteria that reach the food supply are of public health significance. This is where HACCP is the most important. The principles of HACCP applies to all phases of food production, including basic agriculture, food preparation and handling, food processing, food service, distribution systems and consumer handling and use. The seven principles of HACCP are:

1. Conduct a hazard analysis.
2. Identify Critical Control Points (CCPs).
3. Establish critical limits.
4. Establish monitoring procedures.
5. Establish corrective actions.
6. Establish verification procedures.
7. Establish record keeping and documentation procedures.

Conduct a Hazard Analysis

In a process flow diagram all hazards are identified at each stage of fruit juice, together with the significance of the risks presented and measures for control.

Example: A hazard would be the contamination of fruit juice by physical items (e.g. a piece of glass or a dead insect) or chemicals (e.g. residual cleaning chemicals or pesticide residues). Control measures include training of staff on proper cleaning and disinfection procedures, fruit handling procedures, and personal hygiene, as well