Fruit and Vegetables Processing

Level-II

Based on September, 2021 Occupational standards

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Module Title: - Performing Juice Extraction Process

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Introduction to the Module

Juice extraction is one of the main parts of fruit and vegetable processing. Processing of fruits and vegetables is very important to produce products for direct consumption and as food ingredients. During processing, the main objectives are to preserve the color, flavor, texture, and nutrition while prolonging the shelf life of perishable fruits and vegetables. In fruit and vegetable processing the main products are fresh juice, pasteurized juice, jam, jelly, cheeps, dry products...etc

This module mainly contains five units those are prepare the extraction equipment and process for operation, Operate and monitor peeling, destoning and crushing process, Operate and monitor the extraction process, Perform pre-heating and Shut down the extraction process

This module is designed to meet the industry requirement under the fruit and vegetable processing occupational standard, particularly for micro enterprises, small scale and home processor.

In addition to this to contribute in the national economic growth, reduce unemployment rate, reduce post harvest loses, and satisfy customer needs.

LG#23	LO1#- Extraction equipment and process for operation

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Preparing, blending and confirming extraction materials
- Identifying and following workplace documentation
- Checking availability of facilities, storage, and personal.
- Carrying out the Line clearance procedures.
- Following to eliminate or control the risk of cross-contamination.
- Loading Material into percolator and adding solvents

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Prepare, blend and confirm Extraction materials
- Identify and follow Workplace documentation
- Check availability of facilities, storage, and personal.
- Cary out the Line clearance procedures.
- Follow to eliminate or the risk of cross-contamination.
- Load Material into percolator and adding solvents

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks

Information Sheet-1

1.1.Prepare, blend and confirm extraction materials

Fruit juices are beverages made from the extraction of liquid contained in fruits. Fruit juice is a commonly consumed fruit product with a long shelf life and potential nutritional benefits. The most popular ones are pineapple, orange, mango, grapefruit and passion fruit.

Vegetable juices, other than tomato, are not covered by the Fruit Juice Directive, however, due to the many similarities, for best practice it would seem sensible to treat them in the same way. The same product categories would apply, e.g. Vegetable juice, vegetable juice from concentrate, concentrated vegetable juice, vegetable nectar (minimum vegetable contents apply for nectars) etc. Extraction is the process of converting fruits and vegetables into a puree or concentrate that is later on processed to obtain juices, creams, sauces, etc. It is The method of separating most of water and soluble solids (juicing) depends on the fruit variety. Selection of fruit, sorting and washing operation is carrin out prior to juice extraction.

1.1.1 Selection of raw material

- Fruits and vegetables should be absolutely fresh.
- Fruits should be ripe or select mature, undamaged fruits but firm, and uniformly mature.
- All vegetables except tomatoes should be tender.
- Select only fully ripe fruits
- Tomatoes should be firm, fully ripe and of deep red color.
- Fruits and vegetables should be free from dirt.
- They should be free from blemishes, insect damage or mechanical injury.
- Any fruits that are mould or under-ripe should be sorted and removed.
- Wash the fruit in clean water.

https://www.youtube.com/watch?v=MvW-De2I-aY access date 29/11/2023

1.1.2.Preparing the extraction equipment and process for operation

Juice extraction equipment is an essential component of the juice production process. It plays a role in extracting juice from fruits and vegetables, separating pulp and other solids from the liquid. The right juice extraction equipment can produce high-quality, nutrient-rich juice. Confirming that equipment is clean and correctly configured for processing requirements. Equipment must be cleaned every time before use.

A. Juice blender

It is equipment used to take out puree from the pulp, the puree is blended and juice is extracted. Most extractors are variable speeds from chopping action to liquid puree, meaning you can add almost any ingredient and get a smooth blend from it., easy to clean, more versatile and have a larger capacity. Not all blenders are made the same, and you may be wondering which features you need. If you want a quick individual serving, a single-serving blender is fine. However, if you prefer to blend in batches, you may need a larger kitchen blender.



Figure 1.1 Juice blender

B. Fruit Pulpier

Designed for extracting the pulp of most fruits and vegetables such as mangoes, guavas, peaches, tomatoes, bananas, carrot, apples ….etc

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Figure 1.2:- Juice pulpier

C. Fruit and vegetable crusher

It is an instrument used to reduce the size of the equipment. Suitable for crushing hard seedless fruits & vegetables such as pineapple, apple and carrots before pulping or juice extraction.



Figure 1.3:- Juice crusher

D. Filter

Filtration is the process of removing solid particles from a liquid or gaseous fluid by using a filter medium or sieve.

Sieve is used to remove solid particles from a liquid medium. In juice processing, the largest particles are removed by passing the juice from the press through a mesh screen or a continuous self-cleaning centrifuge. Juice to be filtered contains solid particles remaining after the pressing step, as well as mucilaginous material resulting from the clarification treatment.



Figure 1.4:- Sieve

E.Thermometer

Thermometer is a device that measures temperature or the degree of hotness or coldness of the juice.



Figure 1.5:- Thermometer

F. Refract meter

An instrument used to measure the levels of sugar in the juice or to know the concentration of sugar in juice**.**



Figure 1.6:- Refract meter

G. Juice collection vessels or tanks

It is an instrument used to hold product or juice. The pump is switched on and off automatically by means of a special fluid level sensor, after collecting the right amount of juice in the basin. The pump can also always be started manually by pressing the appropriate button.



Figure 1.7:- Tanks

1.1.2.Utility/facilities used in juice extraction process

Utility are services that play vital role in production of juice and processing of raw fruit and vegetables. The most important facility used in juice extraction process are water, electricity, steam compressed air, vacuum…..etc

Water: Water is routinely used in food production as an ingredient, for cleaning, sanitation and manufacturing purposes

Steam: Steam is what water becomes heated to boiling and begins to turn into a gas. One of the most important applications of steam boilers in the food and beverage industry is to use them in cleaning and disinfecting.

Compressed air: - used to transport different transporting product ,packaging materials and others.

Fruit De-stoner: The destoning machine separates the stones (pits) from the fruit before processing. The pits are ejected separately from the mash. Our electric destoning machine simplifies the job everywhere when large amounts of fruit need to be processed – reliably and fast.

Grating mills: These mills are used in small juice operations to produce uniformly sized fruit pieces. Fruit is fed to a rotating grating disk with fixed aperture, and the shredded fruit is discharged at the bottom. Fruit must be relatively firm with small seeds or pitted.

1.1.3. Blending

Blended fruit juice and nectar is the unfermented but fermentable product obtained by adding water with or without the addition of sugars, water, citric acid , syrups and/or honey, or sweeteners, obtained from two or more different kinds of fruits. Juices are blended so as to utilize a too sweet fruit (grape), a bitter fruit (grapefruit), too acidic or tart fruits (sour lime, sour plum, sour cherry, etc.), bland and insipid tasting fruits like pear or apple, and strongly flavoured fruits (guava and banana).

Ingredients

- Papaya/orange/ any fruit
- Sugar
- Lemon
- Water

Some of the common commercial blends of juice are:

- Grape (97%) and lime (3%)
- Grape (50%) and orange (50%}
- Orange (50-75%) and grapefruit (25-50%)
- Apple (97%) and lime (3%)
- Apple (74%) and grapefruit (25%) + 1% sugar
- Apple (50-75%) and pineapple (25-50%) + 1% sugar
- Apple (37%) and plum (62%) + 1% sugar
-

1.2. Identify and follow workplace documentation

I. Documentation of food processing: There simple to follow that will help you organize your company's documentation processes and thereby better prepare your facility to pass an audit. Each step can be catered according to you company profile, but the basis of this plan works across the industry. The food safety manual is a collection of documents which contains all validated and authorized written policies; procedures; programs; specifications; work instruction; register forms; and other documents that are necessary to consistently achieve the production of safe food.

- Specifications
- Manufacturing formulae
- Processing instructions
- Batch production records
- Standard Operating Procedures (SOPs)
- OHS information, including Material Safety Data Sheets (MSDS)

II.Specifications: Food quality specifi cations are guidelines that are used to help develop food and drink products. Written by manufacturers and retailers from the industry, these

cover product color, flavor, and texture, as well as tolerances for specific defects. Some important safety and quality attributes listed in below.

Table 1.1 : Specifications for acceptance

Factor	**Criteria**	**Rationale**
Maturity	Ripeness	Optimum quality
Solids	Adequate level	Affects yield, flavor
Acidity	Appropriate pH level	Flavour, sugar/acid ratio
Colour	Fully developed	Juice appearance
Defects	Appropriate level	A few can be tolerated
Size/shape	Uniform	Ease of handling/juicing
Specific chemicals	Past analyses	Reflect handling/quality
Pesticide residues	Regulatory control	Legality of product
Foreignmatter	Appropriate level	Reasonable limits
Microbial count	Low total, no or few pathogens	Safety/stability of juice
Aflatoxin level	Below proscribed limits	Juice safety

III. Manufacturing formulae: A formula is how a professional specialty food manufacturer will document your information and is based on pounds, kilograms, grams and other weight measurements. These weights are then converted to percentages so any amount or batch size can be made on those confirmed percentages.

IV. Standard Operating Procedures (SOPs: A standard operating procedure is a set of step-by-step instructions compiled by an organization to help workers carry out complex routine operations. SOPs aim to achieve efficiency, quality output and uniformity of performance, while reducing miscommunication and failure to comply with industry regulations.

V. Batch production records: A batch manufacturing record is a document designed to provide a complete record of the manufacturing history of a batch of product. The terminology is widely applied within the Pharmaceutical & Chemical industries and is referenced in many of the pharmaceutical and food regulatory agency requirements.

1.3. Check of facilities, storage, equipment and personal.

A. Facilities: The place where food is manufactured, processed or handled shall comply with the following requirements:

- The premises shall be located in a sanitary place and free from filthy surroundings and shall maintain overall hygienic environment. The vehicles used to transport foods must be maintained in good repair and kept clean.
- Foods while in transport in packaged form or in containers shall maintain the required temperature.
- The premises to conduct food business for manufacturing should have adequate space for manufacturing and storage to maintain overall hygienic environment.
- The premises shall be clean, adequately lighted and ventilated and sufficient free space for movement.
- Floors, Ceilings and walls must be maintained in a sound condition. They should be smooth and easy to clean with no flaking paint or plaster.
- The floor and skirted walls shall be washed as per requirement with an effective disinfectant the premises shall be kept free from all insects.
- No spraying shall be done during the conduct of business, but instead fly swats/ flaps should be used to kill spray flies getting into the premises.
- Continuous supply of potable water shall be ensured in the premises.
- In case of intermittent water supply, adequate storage arrangement for water used in food or washing shall be made.
- Equipment and machinery when employed shall be of such design which will permit easy cleaning.
- Arrangements for cleaning of containers, tables, working parts of machinery, etc. shall be provided.
- Vessel, container or other equipment, the use of which is likely to cause metallic contamination injurious to health shall be employed in the preparation, packing or storage of food. (Copper or brass vessels shall have proper lining).
- All equipment shall be kept clean, washed, dried and stacked at the close of business to ensure freedom from growth of mould/ fungi and infestation.

- All equipment shall be placed well away from the walls to allow proper inspection.
- There should be efficient drainage system and there shall be adequate provisions for disposal of refuse.

B. Check availability of storage : Fresh horticulture produce generally need low temperature and high relative humidity to maximize storage life and maintain the quality and flavour. Mature green fruits may be stored at 10°C to 15°C for 30 days and ripe tomatoes at 4.5°C for 10 days under 85-90 per cent relative humidity. Storage of raw fruits and vegetables. Finished food, packaging materials, ingredients and non-food chemicals

- Storage areas shall be dry and well ventilated.
- Raw material like sugar, pectin, Iodised salt, spices, should be kept on plastic or metal pallets.
- All pallets should be away walls and off the floor for easy and adequate cleaning and inspection; and to avoid any pest harbourage.
- Flavours, if used, should be kept on pallets or in racks in cold room at appropriate temperature specified by the supplier.
- Separate area shall be defined to keep non-conforming materials.
- A separate, secure (locked or otherwise access controlled) storage area shall be provided for cleaning materials, chemicals and other hazardous substances.
- Quality control staff should also inspect the raw fruits and vegetables during storage at the processing plant to ensure they are:
  - ✓ Protected from attack by rodents and insects;
  - ✓ Stored under suitable conditions of temperature and humidity for periods which do not allow excessive deterioration
  - ✓ Handled carefully to minimize mechanical damage.

Table 1.2. Storage of fresh fruit and vegetable

Commodity	Temperature (0C)	Humidity (%)	Storage period
Garlic	0	65-70	6-7 months
Mushrooms	0	95	3-4 days
Green bananas	13–15	85-95	
Immature potatoes	4–5	90-95	
Onions	–1 to 0	65-75	
Oranges	2–7	90-95	
Mangoes	5.5–14	85-95	
Apples	–1 to 4	90-95	1-12 months
French beans	7– 8	95	7-10 days
Tomato, ripe	8.0-10.0	90-95	4-7 weeks
Tomatoes, mature green	7.2	90-95	1-3 weeks

C. Check availability of equipment:

- Checking the efficiency of extraction machine is essential to ensure optimal performance and the production of high-quality extracts.
- clean and sanitize equipment as required as required
- All equipment, surfaces and floors should be thoroughly cleaned after each day's production.
- Water quality is critical. If in doubt use boiled water or add one tablespoon of bleach to 5 litres of water to sterilize it. If water is cloudy, a water filter should be used.
- Pay particular attention to the quality of re-usable bottles, check for cracks, chips etc and wash thoroughly before using.

- Always use new caps or lids.
- Efficient machines are not only environmentally friendly but also contribute to operational cost savings in the long run.
- Efficiency is closely tied to extraction time.
- Consistency is key in extraction processes.
- An efficient of extraction machine should be able to produce consistent results across multiple batches.
- If you observe significant variations in yield or quality between runs, it might indicate issues with the machine's efficiency or operation.
- Proper solvent recovery not only indicates efficiency but also contributes to cost-effectiveness and environmental responsibility.

D. Personal hygiene sanitation standard operating procedures

People who do not maintain an appropriate degree of personal cleanliness, who have certain illnesses or conditions or who behave inappropriately, can contaminate food and transmit illness to consumers so that all workers in food company has to bring health certificates every 6 month showing as they are free from communicable disease for safe production of company products.

Objectives: To ensure that those who come directly or indirectly into contact with food are not likely to contaminate food by:

- Maintaining an appropriate degree of personal cleanliness
- Behaving and operating in an appropriate manner

Personal Hygiene : All food handlers shall keep their finger nails trimmed, clean and wash their hands with soap, or detergent and water before commencing work and every time after using toilet. Scratching of body parts, hair shall be avoided during food handling processes.

All food handlers should avoid wearing, false nails or other items or loose jewelry that might fall into food and also avoid touching their face or hair. Eating, chewing, smoking, spitting and nose blowing shall be prohibited within the premises especially while handling food. Insecticides/ disinfectants shall be kept and stored separately and `away from food manufacturing / storing/ handling areas.

The workers working in processing and preparation shall use clean aprons, hand gloves, and head wears. Persons suffering from infectious diseases shall not be permitted to work. Any cuts or wounds shall remain covered at all time and the person should not be allowed to come in direct contact with food.

Personnel hygiene facilities shall be available to ensure that an appropriate degree of personal hygiene can be maintained to avoid any cross contamination. Such facilities shall be suitably located & designated. Facility shall have following facilities- hand washing, lavoratories, changing facility, rest and refreshment room. Such facility shall be suitable located and designated.

Basic types of PPE and their examples

A hazard assessment can help identify which specialized PPE will be required. There are numerous types of workplace safety equipment available depending on the hazard exposure and work conditions. The following are basic PPE that can help protect employees:



Figure 1.7. overall personal protective equipment

Operators always have to check the following before going to operate machine ;

- Wear appropriate personal protective clothing and/or equipment
- keep personal Hygiene properly
- Parameter setting (pressure, temperature, flow rate, etc.).
- Identify faulty conditions.
- Analyze maintenance requirements.
- Identify the possible hazards.
- Check it is complete, with all safeguards fitted, and free from defects.
- Follow manufacturer specification.
- Establish a safe system of work for using and maintaining the machine.
- Maintenance as required to prevent risk.
- Choose the right machine for the job.
- Make sure the machine/ equipment is;
    - ✓ Safe for work that has to be done when carrying out maintenance;
    - ✓ Properly switched off before clean or adjust the machine.

1.4. Carrying out line clearance procedures

Line clearance is a standardized procedure in manufacturing for ensuring equipment and work areas are free of products, documents, and materials from a previous process. Verifying that the line has been cleared assembling the material needed for the new operation. Line clearance procedures help operators prepare for the next scheduled process and avoid mislabeling or cross-contamination of finished products. Line clearance is most commonly used in regulated industries, such as pharmaceuticals, medical device, and food and beverage manufacturing

1.4.1.Line Cleaning

The Line Cleaning form must be signed by an Authorized Person. More than one Team member may clean and clear the line, but it is the responsibility of the operator trained and assessed in Line Cleaning to ensure that the tasks have been performed and the Line. Starting materials: should be approved according its specification, identification and approval label should be appeared on each packing not yet expired or has been retested. Work area and equipment are

clean and free from any starting materials or other materials not required for the current operation. Any necessary in-process controls and environmental controls should be carried out and recorded. Defective equipment should be withdrawn from use until the defect has been rectified. Production equipment should be cleaned according to detailed written procedures and stored only under clean and dry conditions. Containers for filling should be cleaned before filling. Any significant deviation from the expected yield should be recorded and investigated.



Figure 1.8. line cleaning with vedio

https://www.google.com/search?q=Line+Cleaning&client=firefox-b-d access date 27/11/2023

1.4.2.Line Opening

A Line Opening is carried out after a Line Clearance has been completed and signed to ensure that all related components, machine settings, BPN, Expiry Date, Date of Manufacture (if required) and information boards are all correct and complete before Production starts.

If a foreign product/material is found during a production run then these must be completed:

- Stop the line immediately.
- Record in the Non-Compliance Logbook.
- Report to and give to the area Manager immediately.
- Communicate to the Team.

1.4.3.Line clearance important for manufacturing

Line clearance is not only important for maintaining safety, quality, and efficiency, but it is a requirement of Good Manufacturing Practices within the pharmaceutical industry. The FDA Code of Federal Regulations Title 21 states: “Written procedures shall be established and followed for cleaning and maintenance of equipment, including utensils, used in the manufacture, processing, packing, or holding of a drug product. These procedures shall include, but are not necessarily limited to, the following:

- Assignment of responsibility for cleaning and maintaining equipment;
- Maintenance and cleaning schedules, including, where appropriate, sanitizing schedules;
- A description in sufficient detail of the methods, equipment, and materials used in cleaning and maintenance operations, and the methods of disassembling and reassembling equipment as necessary to assure proper cleaning and maintenance;
- Removal or obliteration of previous batch identification;
- Protection of clean equipment from contamination prior to use;
- Inspection of equipment for cleanliness immediately before use.
- Records shall be kept of maintenance, cleaning, sanitizing, and inspection

1.5. Eliminate or control the risk of cross-contamination.

Contamination is the presence or introduction of a contaminant in the food or food environment (EC Regulation No.852/2004).

Cross-contamination is the unintentional transfer of harmful substances from one surface or food to another. Cross contamination is the transfer of contaminant particularly bacteria from contaminated foods, generally raw to ready-to-eat foods by direct contact, drip or indirect contact using a vehicle such as hand, clothes, knife, thermometers, etc. It is the physical movement or transfer of harmful bacteria from one person, object or place to another.



Figure 1.9.Food Hazard

Risk is the probability of occurring the problem. Based on the nature of the foods, identify how best they support the growth, multiplication and survival of pathogen and leads to (food Borne Disease) FBD. Food cross-contamination is known as the transfer of bacteria or other microorganisms from one substance to another. Cross contamination can also occur in allergens, chemicals and toxins. Cross contamination in food can occur in the following ways:

- Food to food
- People to food
- Equipment to food

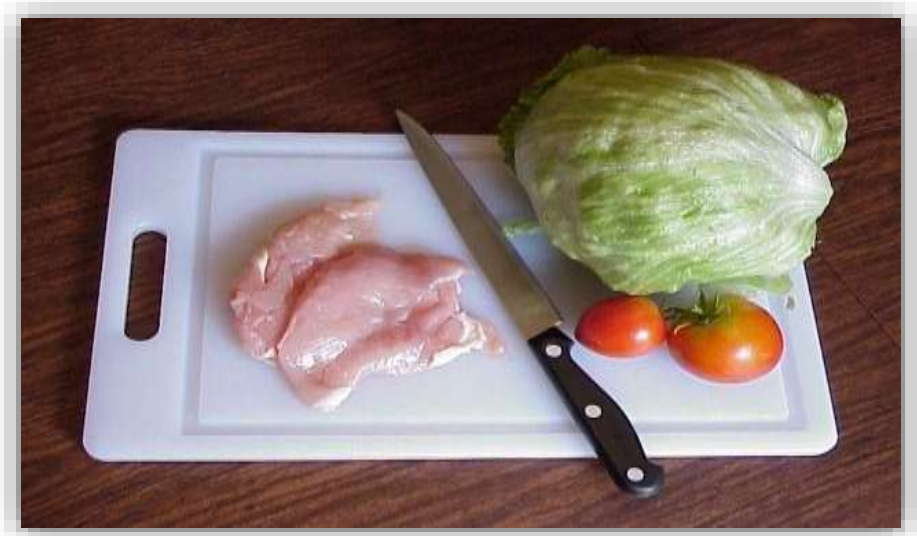


Figure 1.10. Do not handle Vegetable and non-veg products together

Risk factors associated with foods

- Raw materials from unsafe sources
- Inadequate heat treatment without proper validation
- Improper holding temperature and lack of good storage practices
- Contaminated equipment
- Poor personal hygiene
- Health status of the food handlers
- Poor water quality
- Lack of pest management
- Lack of training
- Lack of TCS system (Time, Temperature, Humidity Control System to contain pathogens)
- The issue of Mycotoxins

1.5.1. Prevent cross contamination

All measures and conditions necessary to control hazards to ensure safety of the food and its fitness for consumption, taking into account its intended use (EC Regulation No. 852/2004).This involves preventing objectionable foreign matter getting into the food. Protecting food from contamination such as pathogens, poisons, toxic chemicals, allergens, and foreign bodies.

- Application of food hygiene includes but not limited to;
- Rejecting contaminated food from suspected sources.

1.5.1.1.Ways of prevent/ Control cross contamination

It is a serious concern in the food industry and can lead to foodborne illnesses. To prevent cross-contamination, it is important to identify all hazards that present a risk of contamination to a food and establish control measures to prevent hazards or reduce them to an acceptable level

- Wash your hands frequently and thoroughly with soap and water.
- Clean and sanitize all surfaces, utensils, and equipment before and after use.
- Use color-coded cutting boards to help prevent cross-contamination.
- Cook food to the appropriate temperature to kill harmful bacteria.

https://youtu.be/n7jWt7IF3QY (access 29/11/2023)

I.Control of bacterial hazards

- Remove sources
- Purchase from reputable suppliers
- Check delivery vehicles
- Inspect food on arrival
- Immediate storage
- High standards of personal hygiene
- Prevention o**f** multiplication of pathogens
- Destroying pathogens through processing
- Segregate fit and unfit materials

II.Control of physical hazards

- Control of raw material
- Control of packaging materials
- Control of structure, equipment and machineries through maintenance
- Personal hygiene
- Pest control

III.Control of chemical hazards and allergens

- Reputable suppliers with declaration of all ingredients used (Labeling)
- Segregation of materials with contamination
- Segregation of serving utensils with allergens in catering
- Prevention of cross contamination or carry over
- Cleaning schedule and program
- Training of the personnel in handling of allergens
- Supervision
- Designated storage for controlled use of allergen-containing product
- Communication

1.5.2. Safe fruit and vegetable

Germs are widely found in soil, water, animals and people. They are carried on hands, wiping cloths and utensils, especially cutting boards, and surfaces like door handles and switches. Even the slightest contact can transfer them to food and cause foodborne diseases**.**

A. Keep clean

Wash your hands before handling food and often during food preparation. Wash your hands every time they are exposed to germs (after going to the toilet, blowing your nose, smoking, handling raw, touching unclean surfaces, handling trash etc.)

- Wash your hands before handling food and often during food preparation.
- Wash, and sanitize all surfaces and equipment used for food preparation.
- Utensils especially those from which you eat, drink or in which you cook should not come in touch with raw.
- Protect Food preparation areas and food from insects, pests and other animals.

- Keep food covered, in closed containers and wherever needed, refrigerated.
- Keep food preparation area clean and in good condition (repair cracks, fill holes, do not allow small spaces between fixtures that do not allow cleaning and where dirt and food can

accumulate).

B. Separate raw and cooked

Raw food, especially, meat, poultry and seafood and their liquids can contain dangerous microorganisms which may be transferred onto other foods during food preparation and storage.

• Use separate equipment, utensils (including washcloth) for handling raw foods meats, poultry and sea foods. Use them for other foods always only after washing with hot water and soap.

• Do not let juices or liquids from raw meats, poultry and sea foods to spill or seep onto other surfaces or come into contact with cooked or other raw foods.

• Store foods in covered containers to avoid cross-contamination between raw and prepared foods.

C. Cook thoroughly

Proper cooking can kill almost all dangerous microorganisms. Studies have shown that cooking food to a temparature of 70°C can help ensure it is safe for consumption.

• Ensure food is thoroughly cooked through, especially meat, poultry, eggs and seafood.

• Juices from meats, seafood and poultry should not be pink, and should be clear.

D. Store food at safe temperatures

Microorganisms can multiply very quickly if food is stored at room temperature. By holding food at temperatures below 5°C or above 60°C their growth is slowed down or stopped.

• Do not leave cooked food at room temperatures for more than 2 hours.

• Refrigerate all cooked and perishable foods promptly

• Do not refreeze frozen food after thawing or cooking

E. Use safe water and raw materials

Raw materials, including water and ice, may be contaminated with dangerous chemicals or microorganisms. Toxic chemicals may be formed in damaged and mouldy foods. Select raw materials with care. Simple measures such as washing and peeling may reduce risk.

• Use safe water or treat it (by boiling, chlorination, and filtration) to make it safe for cooking, washing hands or utensils, and making drinks or ice.

• Select fresh and wholesome foods (not damaged or rotting) from clean stores / places

1.6. Loading material in percolator and adding solvents

Load fruit into juice extractor and extract according to manufacturer's instructions. The Extractor's speed and mesh size should be optimized for each fruit type. Solvent extraction is the process of transferring juice from fruit and vegetable cells to a liquid extract (hot water). Water is a suitable solvent (the thing dissolving the solute) for juice. The term 'solvent' can be defined as a substance that has the ability to dissolve a given solute to form a solution with it. Solvent extraction is the process of transferring juice from fruit and vegetable cells to a liquid extract (hot water). The process is mainly used in dry fruits with little water content or fruits and vegetables with higher pectin content, such as wild jujube, dark plum, red dates, haw and etc. Solvent extraction can be divided into static extraction, countercurrent extraction, single leaching and multiple leaching. Common examples of solvents include water, ethanol, methanol and acetone. The three most common types of extractions are: liquid/liquid, liquid/solid, and acid/base (also known as a chemically active extraction).

https://www.youtube.com/watch?v=O5BesFogXms access date 27/11/2023

Self-check-1	Written Test

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Choose the best answers

1._____is the process of converting fruits and vegetables into a puree or concentrate that is later on processed to obtain juices, creams, sauces

A. Concentration B. Extraction C. filtration D. All

2. Objectives of fruit and vegetable processing

A. Reduce wastage and losses C. Stabilize farm prices and income

B. Utilize marketable surplus D. Generate employment E. All

3. Which of the following methods are storing vegetables and fruit?

A. Drying C. Curing and salting

B. Canning D. Freezing E. All

4. Factors to consider when fruit storage?

A. Temperature B. Humidity C. Handling D. All

Test II: Say True/False

1.To prevent cross-contamination, it is important to identify all hazards.

2.All measures and conditions necessary to control hazards to ensure safety of the food and its fitness for consumption, taking into account its intended use.

3. Microorganisms can multiply very quickly if food is stored at room temperature

Test III: Short Answer Questions

1. What is cross Contamination?
2. What is solvent ?
3. List out all juice extraction equipment's?
4. What is Contamination?
5. List at least two methods of Control cross contamination?

LG#24	LO#2-Operate and monitor peeling, destoning and crushing process

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Operating the peeling process
- Performing Crushing process
- Performing Destoning process .

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Operate the peeling process
- Perform Crushing process
- Perform Destoning process

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”

Information Sheet -2

2.1. Introduction to peeling, destoning and crushing process

The juice extraction from fruits and vegetables can be done by size reduction methods as crushing, chopping and comminuting. This is usually employed for fruits that are fully ripened and too soft for whole or diced or sliced packs.

The following points must be remembered in such situations.

- Crushing of products by chopping them into small pieces (0.025-0.075 inch) prior to heating speeds enzyme activity. Hence it is required to remove the air at the time of crushing and immediately after comminuting. Therefore, direct super-heated steam introduction into the chopper or crusher is applied.
- Super-heated steam aids in creating a partial vacuum. So superheated steam preferably under a vacuum will eliminate the air and aid immensely in creating a better consistency in the final product. The equipment used for separation of the pulp is known as a pulper, where mainly the compression force is used. Basket press is a common equipment for taking out juice from soft fruits as oranges.

2.1.1. Operate Peeling process

Peeling is an operation that allows for a better presentation of the product, and at the same time fosters sensory quality, for the material with a firmer and rougher texture is eliminated. Moreover, the skin often presents a color that has been affected by the thermal processes normally used in processing methods. This operation is performed on a regular basis. It consists of the removal of the skin of the fruit or vegetables. Peeling facilitates the operation of cutting raw material into pieces or into slices before processing. Peeling is an operation that allows for a better presentation of the product, and at the same time fosters sensory quality, for the material with a firmer and rougher texture is eliminated. Moreover, the skin often presents a color that has been affected by the thermal processes normally used in processing methods.

Peeling facilitates the operation of cutting raw material into pieces or into slices before processing. Peeling is an operation that allows for a better presentation of the product, and at the

same time fosters sensory quality, for the material with a firmer and rougher texture is eliminated. Moreover, the skin often presents a color that has been affected by the thermal processes normally used in processing methods.Peeling facilitates the operation of cutting raw material into pieces or into slices before processing

I.Trimming and peeling (skin removal): This processing step aims at removing the parts of the fruit which are either not edible or difficult to digest especially the skin.

Up to now the industrial peeling of fruit and vegetables was performed by three procedures: mechanically; by using water steam; chemically; this method consists in treating fruit and vegetables by dipping them in a caustic soda solution at a temperature of 90 to 100° C; the concentration of this solution as well as the dipping or immersion time varying according to each specific case.

II.Peeler (vegetable scraper)

Is a tool, a distinct type of kitchen knife, consisting of a metal blade with a slot with a sharp edge attached to a handle, used to remove the outer layer of some vegetables such as potatoes, mango, pineapple, broccoli stalks, carrots, apples, pears etc..



Figure 2.1- Fruit peeler

III.Mechanical peeling: utilizes knives, blades, or abrasive devices to remove the undesirable part directly from raw food materials.

IV.Steam peeling: - is a technique involves placing raw fruits or vegetables inside a pressure vessel, and exposing them to high temperatures and pressurized steam for rapid heating in a short period (30–45 s).

The main advantages of steam are the reduction of chemical contamination and the reduced salinity issue in wastewater treatment as compared to lye peeling

V.Chemical peeling is a simple process wherein the produce is immersed in hot caustic soda solution for a definite period followed by complete washing of the peeled

The objective of peeling is to remove the outer Peeling may be done in various ways.

2.1.2.Performing destoning process

Destoning is the process of removing stone or contamination from various crops of different sizes and colors. The fruit enters the cylindrical screen through a hopper, transported by a worm screw. The destoning machine separates the stones (pits) from the fruit before processing. The deston De stoning is the process of removing stone or seed from fruit. The de stoning machine separates the stones (pits) from the fruit before processing. The de-stoning/mashing unit is an easy mechanical machine used for removing the stones/seeds and/or mashing from fruits. Fruits that need to de stoning are cherries, plums, peaches, apricots, mango, avocado etc.



Figure 2.2:-.Destoning machine

https://youtu.be/lmzWlgNR9TA?t=4 (acceess 27/11/2023)

I. Working principle of a De-stoner

De-stoners operate using the idea of a fluidized bed to separate material based on their bulk density. Bulk density is the material weight per cubic space it takes up. This is typically expressed as pounds per cubic foot or kilograms per cubic meter. Destoning machine is ideal processing equipment for mango. It has the functions of peeling and destoning. And peeling and destoning can work simultaneously and automatically. The Pulp recovery rate can reach up to 99.5%.

II.Features of Destoning Machine

- ✓ All the processing parts are made of high quality stainless steel.
- ✓ Special equipment and high rate of pulp recovery.
- ✓ Easy cleaning and maintenance.
- ✓ Can work either independently or combined with other fruit processing equipment.

III. De-stoning machine benefits

- ✓ To remove stones or seeds from fruits
- ✓ To break up the mash / flavor
- ✓ To achieve a homogenous mash/pulp
- ✓ For distillery, jam and juice production



Figure 2. 3. Mango destoner

https://youtu.be/zMVf5wxnN3M (accessed 30/11/2023)

2.1.3.Performing crushing process

Crushing is the process of reducing the size of pulp into smaller one. Crushing, chopping and comminuting are used for fruits that are fully ripened and too soft for whole or diced or sliced packs. The goal in juice manufacture is to remove as much of the desirable components from undesirables.

Powered machines that are used to crush fruits consist of a rotating screw inside a casing. The casing has a screen in the base. Juice/pulp drains from an outlet in the base of the casing and skin is rejected from the end of the casing down a chute. Fruit and vegetable that need cut without de stoning are the following: apple, carrot. Pineapple, water melon, cabbage and etc.



Figure 2.4:-Fruit crusher

The juice extraction from fruits and vegetables can be done by size reduction methods as crushing, chopping and comminuting. Crushing of products by chopping them into small pieces (0.025-0.075 inch) prior to heating speeds enzyme activity. The equipment used for separation of the pulp is known as a pulpier, where mainly the compression force is used. Powered machines that are used to crush pineapples or other hard fruits consist of a rotating screw inside a casing. The casing has a screen in the base. Juice/pulp drains from an outlet in the base of the casing and skin is ejected from the end of the casing down a chute. The casing Crushers should be fitted with wing nuts to remove it easily.

Should be cleaned

- Remove the hopper and wash with detergent. Rinse with clean water and allow to dry.
- Remove the casing and wash as for the hopper

- Wash the screw and screen thoroughly, using a brush and detergent. Rinse with clean water.
- Clean the chute and juice/pulp pipe with a water hosepipe and spray gun.
- Ensure that no particles of fruit remain in the machine after cleaning

Crushers should be cleaned after use as follows:

- Remove the hopper and wash with detergent. Rinse with clean water and allow to dry.
- Remove the casing and wash as for the hopper
- Wash the screw and screen thoroughly, using a brush and detergent. Rinse with clean water.
- Clean the chute and juice/pulp pipe with a water hosepipe and spray gun.
- Ensure that no particles of fruit remain in the machine after cleaning

Self- check-2	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: choose the best answers

1.Which one is benefit destoning machine?

A. Remove stones or seeds from fruits B**.** Break up the mash / flavor

C. Achieve a homogenous mash/pulp D. For distillery, jam and juice production E.all

2._____is operation that allows for a better presentation of the product, and at the same time fosters sensory quality, for the material with a firmer and rougher texture is eliminated

A. Crushing B. Peeling C. Filtering D. All

3. From the following unit operation one is removing skin from fruit and vegetable

A.de stoning B. Crushing C. Peeling D. Cutting

4. Which one is an advantage of de stoning?

A. To remove stone B. For homogeneous pulp C .To breaks the mash D. All

5. Reducing the size of fruit and vegetables shows

A. Crushing B. Cutting C. peeling D.de stoning

6. Which one the following is peeling methods of fruit and vegetables

A. Chemical peeling C. Physical peeling C.steam peeling D. All

Test II:Says True /False

1.Peeling is an operation that allows for a better presentation of the product, and at the same time fosters sensory quality, for the material with a firmer and rougher texture is eliminated

2.Destoning is the process of removing stone or contamination from various crops of different sizes and colors

Test II: Short Answer Questions

1. What is peeling?
2. Why we use crushing?
3. Write the benefits of destoning?

Operation Sheet	**1**

2.1.Performing peeling and destoning Mango

A. Tools and equipment

- Peeler machine
- Knives (stainless steel)
- Cutting boards
- PPE(Personal Protective Equipment)

B. **Procedure/Steps/Techniques**

I. Wear (PPE)
II. Clean cutting board
III. Remove defect fruit
IV. Use knife appropriately.
V. Start peeling process.
VI. Destoning/remove stone from mango
VII. Press stop button then ending

LAP Test -1	Performance test

Name……..... ID……. Date……

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **1** hour. The project is expected from each student to do it.

Task: 1 Perform mango peeling &de-stoning operation

LG#25	LO#3-Operate and monitor the extraction process

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Monitoring extraction process
- Identifying and reporting Out-of-specification product/process
- Maintaining work area and documentation
- Conducting work with environmental standards

This learning guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Monitor extraction process to confirm
- Identify and report Out-of-specification product/process
- Maintain work area and documentation
- Conduct Work with environmental standards

Learning Instructions:

1. Read the information written in each unit
2. Accomplish the Self-checks at the end of each unit
3. Perform Operation Sheets which were provided at the end of units
4. Read the identified reference book for Examples and exercise
5. Perform Operation Sheets which were provided at the end of units
6. Do the “LAP test” giver at the end of each unit

Information Sheet 3

3.1. Monitor extraction process

Extraction is the process of converting fruits and vegetables into a puree or concentrate that is later on processed to obtain juices, creams, sauces, etc Some believe that juicing is better than eating whole fruits and vegetables because your body can absorb the nutrients better and it gives your digestive system a rest from digesting fiber. They say juicing can reduce your risk of cancer, boost your immune system, remove toxins from your body, aid digestion and help you lose weight.

Fruit juices are made from pure filtered fruit juice. Citric acid, ascorbic acid, Sodium benzoate..etc can be added as a preservative to extend the shelf life. In addition to adding preservative properly pasteurization of juice increases shelf life of several months and years.

Fresh fruits and vegetables are first graded, of which the high-quality ones are used for fresh selling, canning or dehydrating process. To monitor the juice extraction process, raw material quality, safety and hygiene are very important on the finished product.

Monitor means to conduct a planned sequence of observations or measurements to assess whether a process, point, or procedure is under control and to produce an accurate record for future use in verification. Most fruits can be used to make juice. The most popular ones are pineapple, orange, mango, grapefruit and passion fruit. Methods used to monitor the extraction process, such as inspecting, measuring and testing as required by the process, and the ability to calculate yields. The quality of each day's production should be monitored and controlled to ensure that every bottle of juice has the correct keeping and drinking qualities.

Juice extraction steps

I. Raw materials
II. Sorting
III. Washing
IV. Peeling
V. Crushing and extraction
VI. Filtration
VII. Pasteurization
VIII. Filling and packing

3.1.1.Fruit juice

Juice a liquid beverage made from liquid squeezed of fruit or vegetable. There are a variety of different fruit juices that a person can drink. These include orange juice, mango, avocado, cranberry juice, apple juice, and others. The method of making fruit juice varies depending on the fruit, but many manufacturers make juice by crushing or "pressing" the fruit to squeeze out the juice inside, then, clarifying, pasteurizing or adding preservatives before packaging the final product. Though many fruit juices have health benefits, consuming too much fruit juice can cause health complications for people, such as weight gain or changes to blood sugar levels.

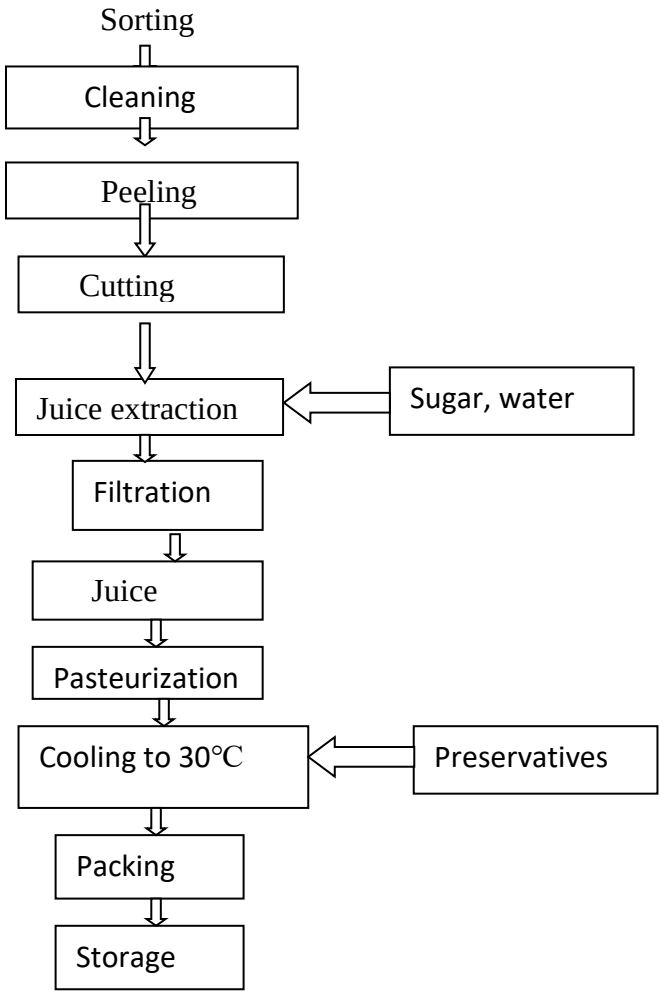


Fig 3.1- Juice processing flow diagram

3.1.2. Filtration

Filtration is the process of removing unwanted materials from the puree. The purpose of filtration is to remove solid particles from a liquid medium. In juice processing, the largest particles are removed by passing the juice from the press through a mesh screen or a continuous self-cleaning centrifuge. This step is sufficient for an unqualified product. To obtain a completely clear product, juice must go through a second step of mechanical filtration



Figure 3.2. Filtration

3.1.3. Pasteurization

Pasteurization is the process of heat treatment which is between 60°C-100°C for 5-30 minute to destroy target microorganisms or inactivate enzymes. In order to produce safe fruit juice that is free of pathogens, is of high quality, meets consumer expectations, and minimizes commercial losses, thermal pasteurization must be effective. There are two types of pasteurization these are low temperature long time and high temperature short time.

3.1.4. Filling and packing

Packaging is the science, art and technology of enclosing or protecting products for distribution, storage, sale, and end use. Packaging also refers to the process of designing, production



Figure3.3. filling and packing machine

https://reliable-machinery.en.made-in-china.com/product/XNdJSELxCkcl/China-Automatic-Fruit-Juice-Packing-Line-Bottle-Washing-Filling-Capping-Machine.html(access 28/11/2023

Functions of packaging

- Protect product from damage
- Containment or holding the product
- Quality protection
- Communication(labels, provide information)
- Convenience



Figure3.4. - Packaging materials

3.1.5. Fruit jam processing

A solid gel made from the pulp of a single fruit or mixed fruits. Jam is the product of fruit that made with the addition of pectin for thickening, sugar for flavoring and preservative, water and additives. The pectin helps to lower the chances of cancer and promotes the health of skin, hair, bones and finger nails. Jam is a thick sweet food that is made by cooking fruit with a large amount of sugar, and that is usually spread on bread.

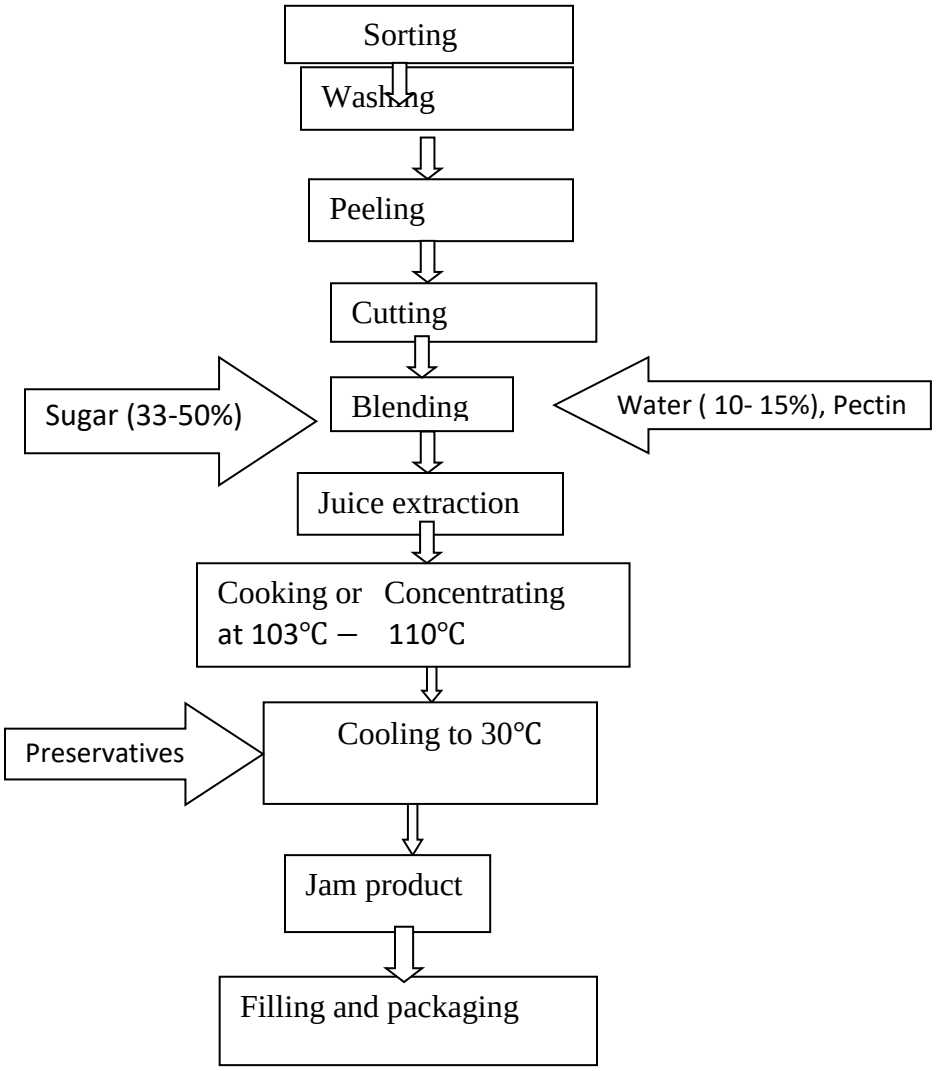


Figure 3.5:- Jam processing flow diagram

Table 3.1- Fruit processing parameters

No	Product name	Temperature (℃)	Sugar concentration(%)	PH	Heating time	Preservatives
1	**Jam**	103-110℃	33-50%	<4.5	20-30 minute	Pectin (0.4-0.8%), Benzoic acid(0.03-0.2%),Ascorbic acid(0.05-0.2%) ,Sodium benzoate(0.05-0.2%) Citric acid (0.2-0%)
2	**Juice**	**65-78**℃	**15-20**%	**2.5-4.0**	**10-15 minute**	Benzoic acid (0.03-0.2%) Ascorbic acid(0.05-0.2%),Sodium benzoate(0.05-0.2%),Citric acid (0.2-0.8)

3.2. Identifying and reporting out-of-specification product/process

Identifying and reporting out-of-specification product/process is a crucial aspect of quality control in the manufacturing industry. It involves identifying products or processes that do not meet the established specifications or standards and reporting them to the relevant authorities. The process of identifying and reporting out-of-specification products or processes is usually guided by standard operating procedures (SOPs)

Food safety and standards authority of India (FSSAI) specification

Table 3.2. specification

Pulp	10%
Total soluble solids	10 to 15o brix
Acidity	0.3 – 0.5%
sodium metabisulphite	70ppm
Sodium Benzoate –	120ppm (For Coloured fruits)

Out-of-specification for Fruit and Vegetables (juice extraction)

Over-ripe fruits should be rejected because they are infected with microorganisms and give a poor quality product. Unripe fruits should be rejected such as:

- Immature fruits
- Over-ripe fruits
- Microbial spoilage
- Overfilling
- Undesirable texture
- Discoloration

Table 3.3. Factors influencing juice yield and quality.

Factor	Effect
Fruit immature	Resistance to juicing, low yield
Fruit inadequately crushed	Resistance to juicing, low yield
Fruit over mature	Undesirables extracted, poor quality
Fruit over comminuted	Undesirables extracted, poor quality
Excessive pressure	Undesirables extracted, dark juice
Excessive time in press	Dark, over extracted juice
Short press cycle	Low yield, lighter juice character
Long press cycle	Low throughput, over extraction
Cold Press	Lower yield, lighter character
Hot press	Higher yield, stronger, darker character
Enzyme treatment	Higher yield, stronger character

3.3. Maintaining work area and documentation

Good housekeeping is the foundation of a safe, healthy and pleasant workplace. It is essential that all areas be kept clean, orderly, and with all necessary things in the proper place. Good housekeeping improves safety, efficiency and quality at the same time

Maintaining a system of organized, accurate and consistent documentation in the workplace is both necessary and beneficial.

Clean industrial work areas procedures

- Assess area to be cleaned
- Select appropriate cleaning equipment and chemicals
- Select the protective clothing and equipment to be used
- Prepare the area
- Undertake the selected cleaning process
- Dispose of waste
- Return area to operational condition
- Check and store cleaning equipment and chemicals

3.3.1. Documents and Records

Documents are written policies, process descriptions, and procedures used to communicate information. They provide written instructions for how to do a specific task. Blank forms are also considered documents. Forms are used to capture data or information from performing a procedure.

Work place documentation include

I. Specification
II. Manufacturing formula
III. Processing instructions
IV. Batch production records
V. Standard operating procedures

3.3.2.Effective workplace housekeeping

- **Prevent slips, trips and falls:** Slips, trips and falls were the second leading cause of nonfatal occupational injuries or illnesses
- **Eliminate fire hazards:** Employees are responsible for keeping unnecessary combustible materials from accumulating in the work area. Combustible waste should be "stored in covered metal receptacles and disposed of daily," according to OSHA's Hazardous Materials Standard
- **Control dust:** Dust accumulation of more than 1/32 of an inch or 0.8 millimeters covering at least 5 percent of a room's surface poses a significant explosion hazard,
- **Avoid tracking materials:** Work-area mats – which can be cloth or sticky-topped – should be kept clean and maintained.
- **Prevent falling objects:** protections such as a toe board, toe rail or net can help prevent objects from falling and hitting workers or equipment.
- **Clear clutter:** A cluttered workplace can lead to ergonomics issues and possible injuries because workers have less space to move
- **Store materials properly:** According to OSHA's Materials Handling, Storage, Use and Disposal Standard
- **Use and inspect personal protective equipment and tools:** Wear basic PPE such as closed-toe shoes and safety glasses while performing housekeeping,
- **Determine frequency** All workers should participate in housekeeping, especially in terms of keeping their own work areas tidy, reporting safety hazards and cleaning up spills, if possible.:
- **Create written rules:** Experts agree that housekeeping policies should be put in writing. Written protocols could specify which cleaners, tools and methods should be used.

3.4. Conducting work according to environmental standards.

Worldwide, governments have remained committed to assuring environmental protection and management by adhering to environmental responsibility. Organizations in the commercial sector should take into account the following environmental considerations:

A.Waste management: Guarantee that your organization's waste storage facility is secure and properly processed and that a licensed garbage contractor collects it. It's also possible to manage garbage for recycling by separating paper and plastic from metal and glass. Food waste must also be separated for recycling by enterprises that deal in food products.

B.Statutory nuisance: A statutory nuisance could hurt the health of others, such as the production of smoke or noise or gas or odor or fumes or the accumulation of waste or light pollution. You must notify the relevant enforcing body if your company operations constitute an imminent threat of environmental damage and if your actions also produce real ecological damage.

C.Hazardous materials: Chemicals and toxic substances constitute a threat to the environment, and businesses need to be aware of this. Ozone-depleting substances (ODS), radioactive materials (RM), solvents for electronics, and biocides are all examples of potentially hazardous substances. Make sure both that you and your company are aware of the environmental dangers associated with the storage, usage, production, and disposal of all hazardous substances at work. It is a legal requirement in the manufacturing industry that certain hazardous substances, including lead, mercury, and calcium, be avoided. Putting out products that contain more than a predetermined number of harmful compounds is illegal for manufacturers.

D. Environmental management systems: Environmental management systems (EMS) are a set of processes and practices that enable an organization to reduce its environmental impacts and increase its operating efficiency. ISO 14001 is an international standard that provides a framework for EMS. It is a systematic approach to managing environmental issues within an organization. The standard is designed to be used by any organization, regardless of its size, type, or location. It provides a framework for managing environmental impacts and improving environmental performance. The standard requires organizations to establish an environmental policy, identify environmental aspects and impacts, establish objectives and targets, and implement programs to achieve those objectives and targets. The standard also requires

organizations to monitor and measure their environmental performance and to continually improve their environmental management system.


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Figure 3.6. Environmental management systems

3.4.1. Environmental regulations and the food industry

Environmental standards are administrative regulations or civil law rules implemented for the treatment and maintenance of the environment. Environmental standards are set by a government and can include prohibition of specific activities, mandating the frequency and methods of monitoring, and requiring permits for the use of resources or food process. Standards differ depending on the type of environmental activity.

3.4.2. Food control

Food control is the regulation of the food supply industry and enforcement of food laws by national or local authorities. The principal objective of the national food control system is the protection of public health by protecting consumers from unsafe, unwholesome, mislabeled or adulterated food. It also contributes to economic development by maintaining consumer confidence and providing sound regulatory controls for domestic and international trade in food.

A food control system ensures that foods conform to safety and quality requirements and are honestly and accurately labeled, as required by law. The scope of food control includes:

- Food safety, which refers to all those hazards that may make food unhealthy for the consumer.

- Food quality standards, which includes all other attributes that influence a product's value to the consumer, e.g. composition, labeling, etc.

Components of a food control system

The main components of a national food control system are:

- food law and regulations
- food control management
- inspection services
- laboratory services for food monitoring and epidemiological data
- Information, education, communication and training.

Self -Check 3	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: choose the best answers

1_____is an evaluation of potential microbiological, chemical, and a physical hazard associated with a particular product and process.

A. Hazard analysis B. Quality control C. Safety D. All

2. Washing procedure consists of**?**

A. Recovery of the products remains from the technological system

B. Pre-rinsing of superficial staining C. Washing with the use of cleaning agents

D. Rinsing with clean water E. All

3.The main components of a national food control system are:

A. Food law and regulations B. Food control management C. Inspection services D. all

Test II:Say True/False

1.The production process of fruit juice and concentrates begins with raw material purchasing

2.Food quality standards, which includes all other attributes that influence a product's value to the consumer.

3.ISO 14001 is an international standard that provides a framework for envaromental management system

Test III: Short Answer Questions

1. Write the Purpose of the material Data Sheet?
2. What is Food control?
3. Write Components of a food control system?
4. List out quality criteria?

Operation Sheet 2	

2:1- Fruit juice extraction

- **Operation title:-** Fruit juice extraction
- **Purpose:-** To practice and demonstrate the knowledge and skill required in juice extraction
- **Instruction:-** Given necessary raw materials, tools and equipments you are required to perform the following tasks. The project is expected from each student to do it. For this operation you have given 2.hours.

A. Raw materials

- Fruit
- Lemon
- Additives
- Sugar
- Water

B.Tools and equipments

- Peeler
- Juice extractor
- Thermometer
- Refract meter
- Cutting board
- Balance
- Oven
- Jar
- Spoon
- Refrigerator
- Measuring cups
- Washing tank

C. Procedures/Steps/Techniques

- Wear personal protective equipment
- Prepare **best fruits and vegetable for processing**
- Prepare all necessary raw materials and equipment
- Start washing raw materials
- Start peeling

- Cut the pulp into smaller pieces
- Load the pulp in to juice extractor
- Add water and sugar into juice extractor and blend with pulp
- Filter the juice
- Pasterize the juice in 65-78℃ for 10-25 minute
- Cool the juice to 30℃
- Fill and pack the product

2.2- Jam production

- **Operation title:-** Jam production
- **Purpose:-** To practice and demonstrate the knowledge and skill required in jam production
- **Instruction:-** Given necessary raw materials, tools and equipments you are required to perform the following tasks. The project is expected from each student to do it. For this operation you have given 2:30 hours.

A.Raw materials

- Fruit
- Lemon
- Additives
- Sugar
- Water

B.Tools and equipments

- Peeler
- Juice extractor
- Thermometer
- Refract meter
- Cutting board
- Balance
- Oven
- Jar
- Spoon
- Refrigerator
- Measuring cups
- Washing tank

C. Procedures/Steps/Techniques

- Wear personal protective equipment
- Prepare **best fruits for processing**

- Prepare all necessary raw materials and equipment
- Start washing raw materials
- Start peeling
- Cut the pulp into smaller pieces
- Load the pulp in to juice extractor
- Add water and sugar into juice extractor and blend with pulp
- Filter the juice
- Pasterize the juice in 103-110℃ for 20-30 minute
- Cool the jam to 30℃
- Fill and pack the product

LAP Test – 2	Performance Test

Name……..... ID……. Date……

Time started: _____ Time finished: _____

Instructions: Given necessary tools and materials you are required to perform the following tasks within 1hrs hour. The project is expected from each student to do it.

Task1- Perform pasteurization process for fruit

Task2:- Perform jam production

LG#26	LO#4- Perform pre-heating

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Operating pre- heater.
- Adjusting the equipment and temperature

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Operate pre- heater.
- Adjust the equipment and temperature

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks

Information Sheet 4

4.1.Operating pre-heater

Pre-heating can be applied to many food industries, such as in dairies for pre-heating fruit and vegetable before it's processed to other products, in breweries for pre-heating the wort before boiling, in industries for pre-heating canned or bottled food before sterilization, and in fruit and vegetable industries for heating up fruits and vegetables before blanching

Pre-heating can be accomplished by either direct or indirect heat transfer from an auxiliary pre-heating agent, such as water or steam

Preheating: After DE aeration, the product is subjected to a second regenerative heat treatment similar to the first. By using MR type corrugated multi tube heat exchangers, we can achieve recuperation values between 70 and 80% heat recovery from the product.

The primary pasteurization is done as soon as possible after juice extraction, or as a first step in the evaporator. This pasteurization is commonly done at 95–98°C for 10 to 30 seconds. The main objective is to inactivate enzymes from the fruit, but microorganisms also are inactivated during the pasteurization. Inactivation of enzymes generally requires more intensive pasteurization conditions than what is required to destroy microorganisms

4.2.Adjusting equipment and temperature

The heating medium is hot water, usually under the boiling temperature. The pasteurizer heat up the raw materials to 68-70℃, keep this temperature for 30min and cool down suddenly to 4-5℃**.** As the death point of most bacteria is 68℃ and under 30 min, so this process can eliminate most bacteria. Then, the sudden temperature drop will cause the bacteria to die.

Pasteurization of juice can be done for temporary preservation (pre-pasteurization) and in this case this operation is carried out with continuous equipment (heat exchangers, etc.); warm juice is stored in drums or large size receptacles (20-30 kg). Pasteurization conditions are at 75°C in continuous stream.

4.2.1. Fruit juice heating equipment's

Nowadays, large fruit and vegetable juice manufactures usually adopt UHT technology to heat up the liquid to high temperature and keep for very short time. Generally, there are plate pasteurizer, tubular pasteurizer and steam pasteurizer 3 types, and plate pasteurizer is the most prevalent. Plate pasteurizer integrates the function of preheating, sterilization, heat preservation and cooling.

I. Checking Equipment

The purpose of an inspection is to identify whether work equipment can be operated, adjusted and maintained safely with any deterioration detected and remedied before it results in a health and safety risk. The need for inspection and inspection frequencies should be determined through risk assessment. Food processing equipment is typically designed and built with a particular function or unit operation in mind. However, the method in which these functions and operations are executed can vary depending on the design of the equipment, and additional components can be integrated to facilitate smoother operation.

II. Performance Checking

Performance includes the progress of the line to meet production targets and additionally it includes the monitoring of the production line in relation to organizational or customer specification, quality and compliance requirements. You must know how and be able to check tools, equipment and resources are used efficiently and effectively in line with regulatory and organizational requirements. You must be able to ensure quality and compliance specifications are adhered to, records are maintained and reports relating to the progress and performance of the production line are communicated to relevant colleagues.



Figure.4.1. Performance of checking equipment

III.Function Checking

The particular function for which a piece of equipment is intended largely determines the general type of equipment employed. For example:

- Material handling equipment includes conveyors and tube systems
- Preparation equipment includes sterilizers or wash systems
- Heat processing equipment includes ovens and fryers
- Preservation equipment includes freezers and dehydrators
- Production distribution equipment includes wrapping and palletizing systems

4.2.2.Develop the habit of regular maintenance

The daily maintenance of fruit juice processing machinery aims to keep the machine clean and shining, and ensure they are operating normally and neatly. These contribute to long-term steady production, and prolong the service life of fruit processing equipment. In a word, regular maintenance is a way to achieve better economic efficiency. The service life of a fruit processing machine depends on whether you have properly maintain it after using. Any troubles emerging in fruit processing would cause great loss to the company. Therefore, frequent maintenance for fruit juice processing machine is of great necessity during every change of the seasons.

4.2.3. Heating equipment

A. Oven

An oven is a tool which is used to expose materials to a hot environment**.** Ovens contain a hollow chamber and provide a means of heating the chamber in a controlled way. It is used to concentrate juice product and heat treat.



Figure:-4.2. Oven

B. Sterilizer

Is an instrument used to sterilize tools and food products means to clean it by destroying germs or bacteria**.**



Figure;-4.3. Sterilizer

C. Freeze

Is a device that maintains a temperature below the freezing point of water is called a freezer. Freezer units are used in households as well as in industry and commerce. It is thermally insulated compartment and a heat pump (mechanical, electronic or chemical) that transfers heat from its inside to its external environment so that its inside is cooled to a temperature below the room temperature.



Figure:-4.4. Refrigerator

4.2.4. Setting methods of heat treatment

It is the process of selecting method of heat treatment based on juice type and parameters in order to safely preserve foods using heat treatment. The following criteria must be known:-

- What time-temperature combination is required to inactivate the most heat resistant pathogens and spoilage organisms in one particular food?
- What are the heat penetration characteristics in one particular food, including the can or container of choice if it is packaged?

I.Canning is a process where food is sealed in air-tight glass jars, to interrupt and delay the food's natural decay and spoilage. The jar's seal must be air-tight so that no air can get in to re contaminate the food.

Two types of canners are commonly used to process fruit and vegetables.

These are the boiling water canner, and the pressure canner.

The choice of method depends on the acid content of the produce you are processing.

The choice of method depends on the acid content of the produce you are processing.

A. Boiling water bath

A water bath canner is a large pot with a loose cover and a rack to hold jars, off the bottom.

The pot should be deep enough to cover the canning jars by one to two inches and still have another inch of space to allow brisk boiling. The diameter of the pot should be no more than four inches wider than the diameter of the stove's burner to ensure even heating.

Acidic foods such as fruits, tomatoes, pickles and relishes (pH < 4.5), and high sugar foods such as jams, jellies, syrups and mall11alades can be safely processed using a boiling water bath.

B. Pressure canning

A pressure canner is required for processing low acid foods such as vegetables (pH 4.5). A pressure canner is a specially made heavy pot with a locking lid. An inner rack and a steam vent in the lid. The vent can be adjusted using a weight, value or screw depending on the type of canner. A pressure

gauge registers the air pressure inside the canner. A dial gauge gives a reading of the actual pressure. While weighted gauges 'will rock gently when the canner is at the proper pressure.

I.Canning Operations

- Cleaning and further preparing the raw food materials
- Blanching it
- Filling the container usually under a vacuum
- Closing and sealing the container
- Sterilizing the canned products
- Labeling
- Warehousing the finished goods

II. Hot Filling

Hot Fill Process is proven and recognized method of high acid foods (pH less than 4.6) that will be shelf stable at ambient temperatures. As the name implies, hot fill process is a food processing where product is filled in to the finished containers and capped the container when they are still hot, and then cooled. In this case “hot” is characterized by temperature that is high enough to assure that all products in container is at or above the minimum prescribed when the closure (lid) is applied

Self -Check -4	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: **choose the best answers**

1.Which of the following is low temperature?

A, blanching B. Pasteurization C. Freezing D, all

2.Microorganism growth quickly?

A. high temperature B. Low temperature C. Room temperature D. All

3.Pasteurization is _____

A. Kill all micro-organism B. Kill micro-organism below the boiling point of water

C. It is a process of food preservation D. B&C

Test II: Short Answer Questions

1. What temperatures are best for pre heating juice?

2. Write the equipment used to heating juice?

3.Write the uses operating pre heating?

4.Write the setting methods of heat treatment?

LG#27	LO#5- Shut down the extraction process

Instruction sheet
This learning guide is developed to provide you the necessary information regarding the following content coverage and topics: • Shutting down process. • Identifying and reporting requirements. This learning guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to: • Shut down process. • Identify and report requirements.
Learning Instructions:
1. Read the information written in each unit 2. Accomplish the Self-checks at the end of each unit 3. Perform Operation Sheets which were provided at the end of units 4. Read the identified reference book for Examples and exercise 5. Perform Operation Sheets which were provided at the end of units 6. Do the “LAP test” giver at the end of each unit

Information Sheet-5

5.1.Shutting down process

Shutting down: Normal shutdown includes steps to render the systems safe, such as removal of hazardous process materials and inert (asphyxiating) gases. The systems might be cleaned as part of the shutdown; cleaning is often a process unto itself requiring its own set of startup, operation, and shutdown procedures. Shut down must be conducted using the standard procedures established for the machine or equipment (not emergency procedures or other shortened/simplified method).

When shutting down an industrial machine, it is important to follow proper procedures to ensure safety

I. End of production sequence: When pausing a manufacturing line, it is crucial to allow the machine to empty itself of all the components. The end of the production sequence clears the manufacturing equipment without loading new products into the cycle. This cycle finishes components in a machine and automatically removes most of the glue, parts, liquid, and powder from the production path. There are, however, certain elements that will not be automatically emptied until a later stage of the manufacturing processes. It may be necessary to remove these elements manually and thus completely empty the machine of any stray material that can complicate startup.

II.Air purge: Once the machine is out of service, the next thing we recommend is to purge any air that may be present in the equipment. Machines often use compressed air to activate the different cylinders, and most machines have an air purge valve that allows for bleeding off any accumulated air. This is important because the air can crystallize and eventually wear out pneumatic components.

III. Cleaning of the machine: Beyond clearing the line of product and residue, purging air, and cleaning filters, you should take the time to clean the machinery thoroughly during shutdown. Cleaning now will avoid unpleasant surprises at startup. For example, in the previous example where a company left oil in their system, which froze, cleaning it was longer and more complex than just emptying it. During cleaning, they had to dismantle pipes and small components, resulting in broken parts because it was so “jammed”. It added an extra layer of unnecessary work and problems. Invest the time today, and you’ll save time in the long run.

V.De-energization and lockout: De-energization may include shutting off a machine and unplugging it, or disconnecting a switch before a lock is applied to prevent the machine from being started up accidentally. Once de-energization is complete, lockout can be applied

- **Equipment's Safety precautions**
  - ✓ Read all instructions.
  - ✓ Do not operate this or any appliance with a damaged AC cord or plug.
  - ✓ Do not operate if appliance malfunctions, has been dropped or appears damaged in any manner. Never attempt home repairs. Only a qualified appliance technician should repair appliance before re-use.
  - ✓ To avoid electric shock or serious personal injury, do not use any attachments or utensils that were not recommended or supplied by the manufacturer.
  - ✓ To protect against risk of electrical shock or injury, never immerse power cord, plug, or main unit in water, or other liquids.
  - ✓ Do not let Power Cord hang over the edge of table, counter, or come in direct contact with hot surfaces such as stoves.
  - ✓ Make sure the Lid is attached properly and is securely locked before operating the Power Juicer.
  - ✓ Make sure the motor stops completely and the unit is unplugged from the electrical outlet before disassembling, assembling or cleaning.
  - ✓ Should juicer suddenly stop or develop excessive vibration or unusually loud noise, shut off and unplug unit immediately, wait for Blade to stop running, then disassemble, clean thoroughly and reassemble.
  - ✓ To avoid risk of personal injury keep hands and utensils out of the juicer and away from its sharp Blade during operation. Use the Pusher, not fingers or utensils, to feed the produce into the juicer.
  - ✓ Never disengage the Locking Bar during operation.
  - ✓ The juicer Blade is extremely sharp. Use extreme caution when handling.

- ✓ Should food become lodged in the Chute, and moderate Pusher pressure will not dislodge it, turn the Power Switch off, allow the motor to stop completely, then unplug the AC cord, disassemble the juicer and remove the blocked food.
- ✓ Avoid personal injury. Never assemble the unit without using all components in their proper sequence, making certain the Blade is properly seated and secured in the Filter and Receptacle

http://oogle.com/search?q=juice+extractor+machine+dismantle+procedure&sca_esv=572463874&sxsrf=AM9HkKmU7 access date 29/11/2023

5.2. Identifying and reporting equirements

Manufacturers generally recommend a set of equipment maintenance tasks that should be performed at regular intervals: daily, weekly, monthly or yearly. Following these recommendations will ensure that the equipment performs at maximum efficiency and will increase the lifespan of the equipment. In order to report faults and problems, there should be maintenance schedule. Every work shop has a different maintenance schedule and it is important that you are familiar with the schedule implemented on the work shop where you work.

Self -Check -5	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: **Say True/False**

1.Normal shutdown includes steps to render the systems safe, such as removal of hazardous process materials and inert

2.Shut down must be conducted using the standard procedures established for the machine or equipment

3.Every work shop has a different maintenance schedule and it is important that you are familiar with the schedule implemented on the work shop where you work.

Test II: Short Answer Questions

1. Write shut down procedures for juice extractor?

2. Write three shut down pre conditions?

3. Write maintenance requirements?

4. What are the uses of maintenance?

5. Write the difference between planned and unplanned maintenance?

Operation sheet -4	Performance test

5.1 Shut down process for Juice extractor

A. **Tools and Equipment**

- PPE
  - ✓ Gloves
  - ✓ Shoes
  - ✓ Face mask
  - ✓ Gown/Overall

B. Procedure /Steps/ Techniques

I. Wear appropriate personal protective equipment's.
II. Turned off by pressing the 'On/Off' switch on the control panel to 'Off'.
III. Switch the appliance off at the power outlet and unplug the cord.
IV. Store in dry and clean place ready for operation

LAP Test -4	Performance Test

Name……..... ID……. Date……

Time started: _____Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 1hrs hour. The project is expected from each student to do it.

Task1- Perform Shut down process

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