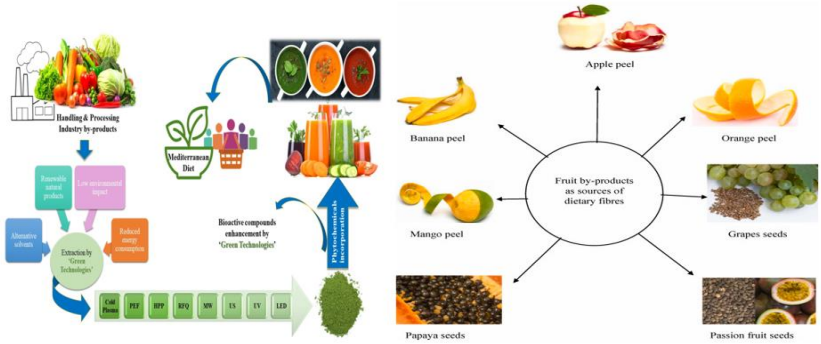
Fruit and Vegetable Processing

Level-II

Based on June 2021, Version 3 Occupational standards (OS)



MODULE TITLE: HANDLING- BY-PRODUCT MANUFACTURING PROCESSES

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Introduction to the module

This module covers the knowledge, skills and attitude required in the collection of by-product and manufacture of stockfeed and other products. The module includes identify finish by-product requirement, obtain correct micronutrient or other additive, add micronutrient or additive to product and record use of micronutrient or additive

LG #28	**LO #1 Identify finish by-product requirement**

Instruction sheet

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

- Identifying production schedule, customer order or Standard Operating Procedure (SOP to be manufactured.
- Identifying Micronutrient or additive requirements from screen, recipe, standard operating procedure or supervisor from hazards and risks.

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:

- Identifying production schedule, customer order or Standard Operating Procedure (SOP to be manufactured.
- Identify Micronutrient or additive requirements from screen, recipe, standard operating procedure or supervisor from hazards and risk

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 1

1.1 Identifying production schedule, customer order or Standard Operating Procedure (SOP to be manufactured).

1.1.1 Identify manufactured product from production schedule, customer order or Standard Operating Procedure (SOP).

Fruit and vegetable manufacturing refers to the process of converting fresh fruits and vegetables into various food products. This industry plays a crucial role in preserving the nutritional value and extending the shelf life of fruits and vegetables, making them more accessible and convenient for consumers. Here are some key aspects and steps involved in fruit and vegetable manufacturing:

Sourcing: The process begins with the procurement of fresh fruits and vegetables from farms, orchards, or wholesale markets. These raw materials undergo quality checks to ensure they meet the required standards for processing.

Sorting and Grading: Once the fruits and vegetables are sourced, they go through sorting and grading processes. This involves separating them based on factors such as size, color, ripeness, and quality. Advanced technologies like optical sorting systems are often used for accurate and efficient sorting.

Washing and Cleaning: The produce is thoroughly washed and cleaned to remove dirt, debris, pesticides, and other contaminants. This step is crucial for maintaining hygiene and food safety standards.

Cutting and Slicing: Depending on the final product, the fruits and vegetables may be cut, sliced, diced, or chopped. Automated cutting machines are often employed to ensure uniformity and precision.

Processing and Preservation: Various processing techniques are applied to the fruits and vegetables to enhance their shelf life and create value-added products. Common methods include blanching, canning, freezing, drying, juicing, pureeing, and fermenting. These processes help retain nutrients, flavors, and textures while ensuring microbial safety.

Packaging: The processed fruits and vegetables are packaged in suitable containers or packaging materials. Packaging serves multiple purposes, including protection from physical damage, preservation of freshness, and providing information to consumers.

Quality Control: Throughout the manufacturing process, quality control measures are implemented to ensure that the products meet the required standards. This involves regular testing, monitoring, and inspection of the raw materials, intermediate stages, and final products.

Distribution: Once the products are packaged and quality-checked, they are ready for distribution to retailers, wholesalers, or food service providers. Efficient logistics and supply chain management are essential for timely delivery and maintaining product freshness.

Product Range: Fruit and vegetable manufacturing encompasses a wide range of products, including canned fruits and vegetables, frozen fruits and vegetables, dried fruits and vegetables, fruit juices, purees, sauces, pickles, jams, and more. The specific product offerings depend on market demand and the capabilities of the manufacturing facility.

It's important to note that fruit and vegetable manufacturing practices may vary depending on the specific product and the scale of operations. Large-scale manufacturing facilities often employ automated processes, while smaller operations may rely on manual labor to a greater extent. Additionally, industry regulations and food safety standards play a crucial role in ensuring the quality and safety of the final products.

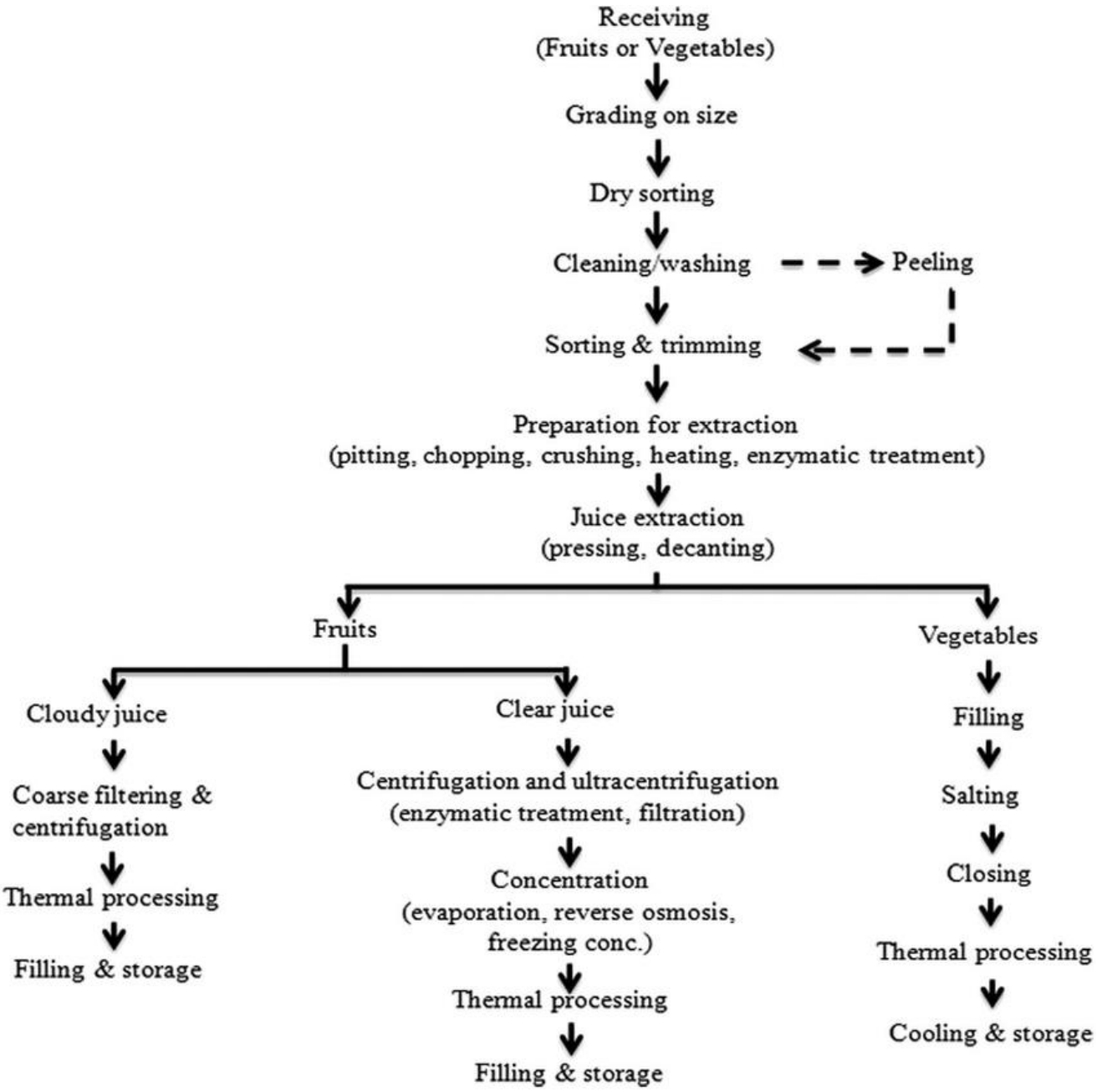


Figure 1.1: Steps involved in juice processing from fruits and vegetables.

Scheduling fruit and vegetable processing involves planning and organizing the various stages of production to ensure efficient and timely processing. While specific schedules may vary depending

on factors such as the type of fruit or vegetable, processing method, and market demand, here is a general outline of the scheduling process:

Demand Forecasting: The first step in scheduling fruit and vegetable processing is to forecast the demand for processed products. This involves analyzing market trends, customer preferences, and historical data to estimate the expected demand for different products.

Raw Material Availability: Once the demand is forecasted, the next step is to assess the availability of raw materials. This includes considering factors such as seasonal availability, crop yields, and supplier contracts to ensure an adequate supply of fruits and vegetables for processing.

Production Planning: Based on the demand forecast and raw material availability, a production plan is developed. This plan outlines the quantity and types of products to be processed, as well as the timeline for each production batch.

Equipment and Resource Allocation: The production plan is then used to allocate resources such as processing equipment, labor, and utilities. This ensures that the necessary resources are available at the right time to meet the production schedule.

Processing Sequence: The processing sequence is determined based on factors such as product characteristics, processing requirements, and equipment availability. This includes deciding the order in which different fruits and vegetables will be processed to optimize efficiency and minimize downtime.

Time and Temperature Control: Fruit and vegetable processing often involves temperature-sensitive steps such as blanching, pasteurization, or freezing. Scheduling these steps requires careful consideration of the time and temperature requirements to ensure product safety and quality.

Quality Control Checks: Throughout the processing schedule, regular quality control checks are conducted to monitor product quality and compliance with standards. This includes inspections, testing, and sensory evaluations to identify and address any issues that may arise.

Packaging and Distribution: Once the processing is complete, the products are packaged and prepared for distribution. Scheduling packaging activities and coordinating with logistics partners ensures that the processed products are delivered to customers or retailers in a timely manner.

It is important to note that the scheduling process may also involve contingency plans to address unforeseen events such as equipment breakdowns, supply chain disruptions, or changes in market demand.

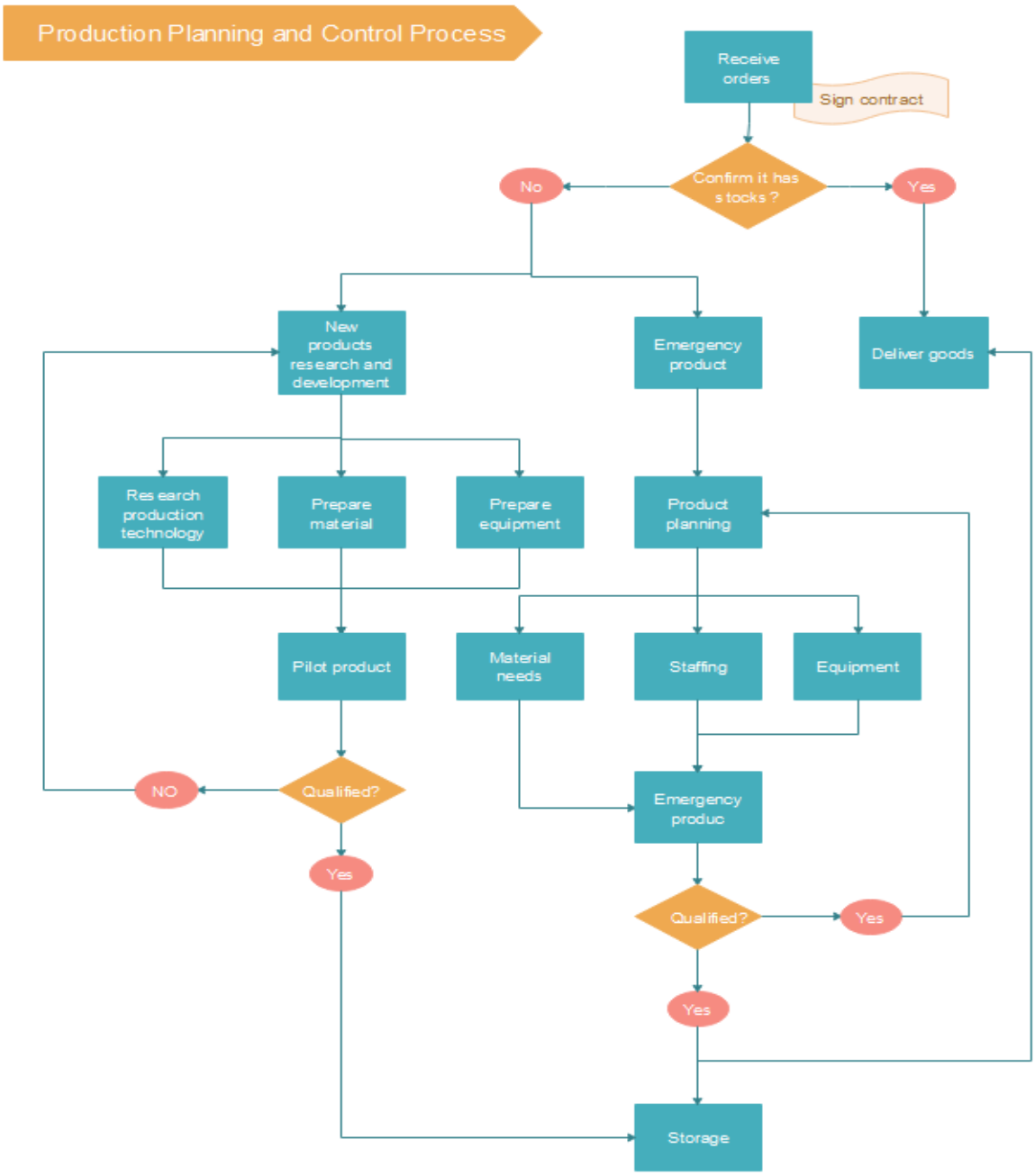


Figure 1.2: Scheduling of production planning and processing control

A Standard Operating Procedure (SOP) is a document that outlines the step-by-step instructions for completing a specific task. In the context of fruit and vegetable processing, SOPs are essential

for ensuring consistent and safe handling of produce. Here is an overview of how to develop an SOP and some examples of tasks that may warrant a written SOP.

How to develop an SOP:

- Accurately capture all the steps involved in a specific task by either performing the task yourself or observing someone else doing it.
- Write down all the necessary tools and materials needed for the task.
- Include any tricks or efficiencies that can make the task easier.
- Seek input from those who routinely perform the task to ensure accuracy and inclusion of important details or efficiencies.

A general format for an SOP might consist of the following parts:

a. Title
b. Objective/purpose
c. Scope
d. Responsibility
e. Materials
f. Procedure
g. Verification/documentation.

Characteristics of good SOPs:

a. Easy and rapidly accessible to employees.
b. Able to be followed by anyone with basic knowledge.
c. Written using short, direct sentences and simple words wherever possible.
d. Use diagrams and pictures wherever appropriate.
e. Separate general information from instructions.
f. Don't micromanage - include only essential details that must be completed in the same way by any worker.

Standard Operating Procedure (SOP) for Fruit and Vegetable Processing

Title: Washing Fruits and Vegetables

Objective: To ensure that all fruits and vegetables are properly washed before further processing to maintain food safety and quality.

Procedure:

Gather all necessary equipment and supplies, including food-grade detergent, clean water, food-grade sanitizer, brushes, and clean containers.

a. Set up a designated washing area that is clean and free from contaminants.
b. Sort and remove any damaged or spoiled fruits and vegetables.
c. Rinse the fruits and vegetables under running water to remove any visible dirt or debris.
d. Fill a sink or basin with clean water and add the appropriate amount of food-grade detergent according to the manufacturer's instructions.
e. Immerse the fruits and vegetables in the soapy water and gently agitate them to remove any remaining dirt or residue.
f. Use brushes or scrubbers to clean the surfaces of hard-skinned fruits and vegetables, such as potatoes or melons.
g. Rinse the fruits and vegetables thoroughly under running water to remove any soap residue.
h. Prepare a sanitizing solution by following the manufacturer's instructions for the food-grade sanitizer.
i. Immerse the fruits and vegetables in the sanitizing solution for the recommended contact time.
j. Remove the fruits and vegetables from the sanitizing solution and allow them to air-dry in a clean and designated area.
k. Once the fruits and vegetables are dry, they are ready for further processing or packaging.

Responsibility: All employees involved in fruit and vegetable processing are responsible for following this SOP and ensuring that the washing process is carried out correctly.

Materials:

- Food-grade detergent
- Clean water

- Food-grade sanitizer
- Brushes or scrubbers
- Clean containers for drying

Verification/Documentation: Regular monitoring and documentation should be conducted to ensure compliance with this SOP. Records should include the date, time, and initials of the employee responsible for the washing process.

The fruit and vegetable processing market plays a significant role in the food industry by transforming fresh fruits and vegetables into a wide range of processed products. These products cater to consumer needs such as convenience, longer shelf life, and value-added options. The market includes various products such as canned fruits and vegetables, frozen produce, fruit juices, dried fruits, and vegetable purees.

The global fruit and vegetable processing market is estimated to have reached nearly USD 8.7 billion in 2022 and is projected to reach nearly USD 11.8 billion by 2027. Some of the latest fruit and vegetable processed products include:

Canned fruits and vegetables: Canned fruits and vegetables provide a convenient and long-lasting option for consumers. These products are processed and preserved in cans, ensuring their availability throughout the year.

Frozen produce: Frozen fruits and vegetables are processed by freezing them at their peak freshness, preserving their nutritional value and flavor. These products are convenient and can be easily stored for longer periods.

Fruit juices: Fruit juices are processed by extracting the juice from fresh fruits and packaging it for consumption. They provide a convenient way to enjoy the flavors and nutritional benefits of fruits.

Dried fruits: Dried fruits are processed by removing the water content from fresh fruits, resulting in a concentrated and shelf-stable product. Dried fruits are a popular snack option and can be used in various recipes.

Vegetable purees: Vegetable purees are processed by blending or grinding vegetables into a smooth consistency. These purees can be used as ingredients in various dishes, sauces, and soups.

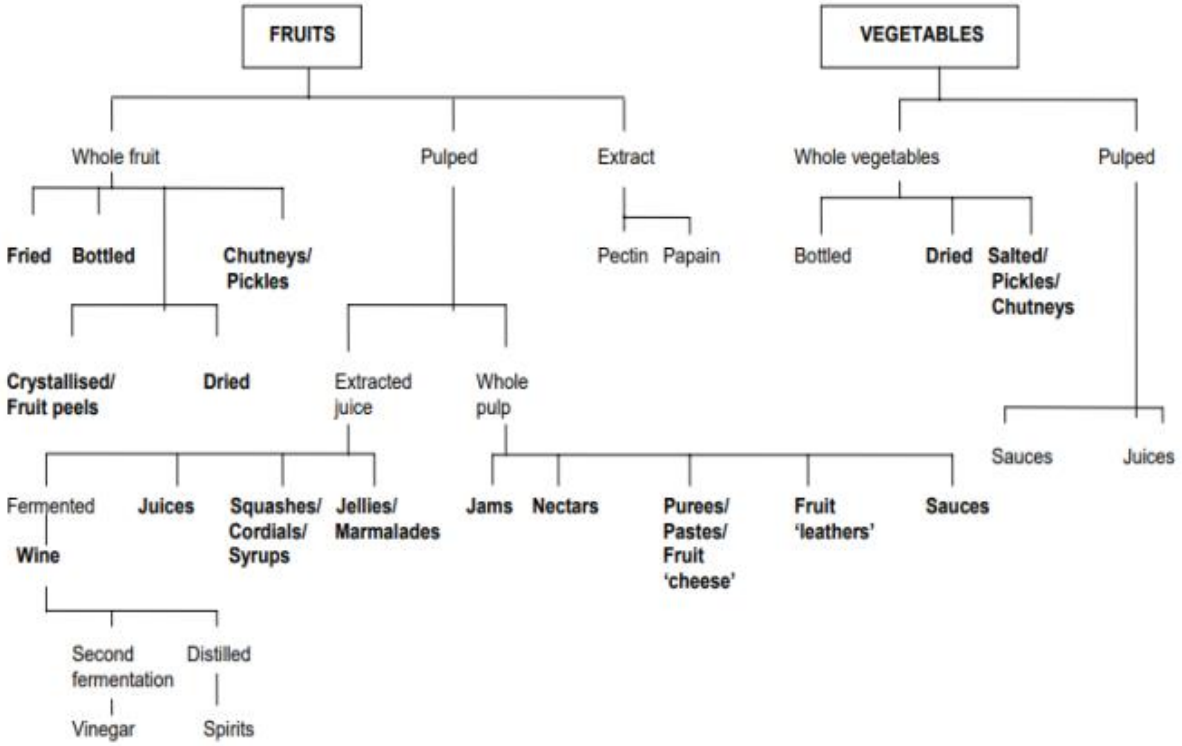


Figure 1.3: Fruits and vegetables products

Based on their requirement amount of fruit and vegetable product:

- High demand include:
- Dried fruit (pineapple and banana for export)
- Fruit wines (especially pineapple)
- Fried snacks (banana or potato chips)
- Juices (pineapple and passion fruit)

- Squashes and cordials
- Tomato sauce.
- Low demand include:
- Jams, jellies and marmalades
- Bottled fruits
- Chutneys and pickles
- Purees and pastes

On the other hands, the term “by-product” suggests that plant food wastes might be usable and have their own market. These by-products might reach around 60% of harvested plants.

While, byproduct is a common outcome in the majority of production processes it is in a lesser quantity and is of lower overall value as compared to the main product. One of the important by products of commercial value is pulps of fruit and damaged vegetable, produced mainly from underutilized. Shark fins. The commercial value of the fins depends on their color, size, variety and quality.

The waste utilization of fruit processing industries has become one of the main challengeable aspects in the world due to the generation of large quantities of byproducts including:

- Peels,
- Seeds and
- Unused flesh in different steps of processing chain.

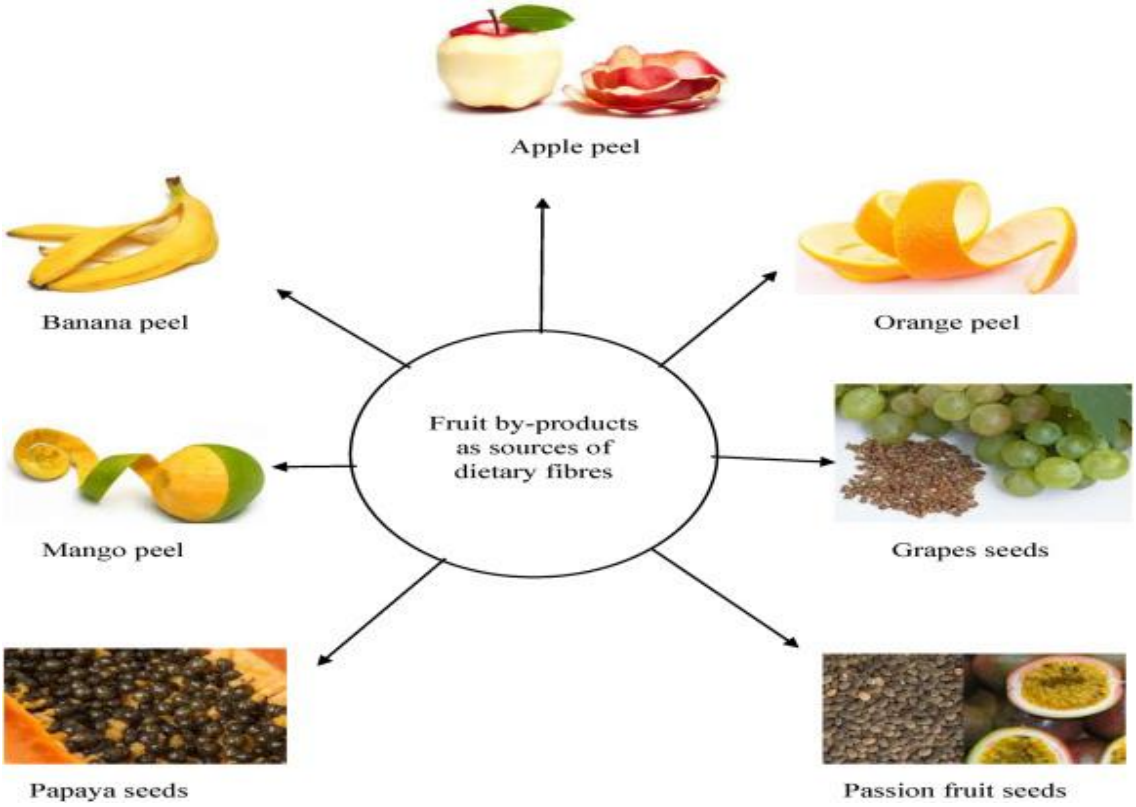


Figure 1.4: Fruits and it's by product

However, these plant by-products are rich in valuable compounds that can be used in various industries as:

- Novel,
- Low-cost,
- Economical and natural sources of dietary fiber,
- Antioxidants,
- Pectin,
- Enzymes,
- Organic acids,
- Food additives and
- Essential oils etc through different methods of extraction, purification and fermentations

During the processing of fruits and vegetables, large quantities of solid and liquid wastes are produced. The waste obtained from fruits and processing industry is extremely diverse due to the use of wide variety of fruits and vegetables, the broad range of processes and the multiplicity of

the product. Finished Product is defined as the medicinal product that has undergone all stages of production, including packaging in its final container. The most recent Food Balance Sheets indicate that fruits and vegetables presented the highest values of food losses along the food chain compared to the rest of the commodity groups: cereals, roots and tubers, oilseeds and pulses, meat, fish and seafood, and dairy products. For example

The pineapple (Ananas comosus) is one of the most important fruits in the world and is the leading edible member of the family Bromeliaceae. This fruit juice is the third most preferred worldwide after orange and apple juices. Pineapple by-products are:

- ✓ Residual pulp,
- ✓ Peels,
- ✓ Stem and
- ✓ Leaves

Processing residuals ranges between 45 to 65%, an indication of serious organic-side streams disposal challenges, which causes environmental pollution if not successfully utilized. Peel is the major bio-waste generated during pineapple processing. Sugars are present in large quantities in pineapple peel that can be used as nutrients in fermentation processes. The peel can be used as a potential substrate for methane, ethanol and hydrogen generation. The second major bio-waste is the core and can be used for the production of pineapple juice concentrates, alcoholic, non-alcoholic beverages or vinegar.

Apples processing generates skin, stems, and residual flesh, which are considered as a potential value added food ingredient. Apple pomace is the main by-product of apple cider and juice processing industries and accounts for about 25% of the original fruit mass at 85% (wet basis) moisture content. It is considered a rich source of dietary fiber, especially pectin, with a content in the range of 10-15% (w/w dry basis), depending on the source.

1.2 Identifying micronutrient or additive requirements from screen, recipe, standard operating procedure or supervisor from hazards and risks.

1.2.1 Identify micronutrient or additive

Micronutrients are one of the major groups of nutrients your body needs. They include vitamins and minerals. Vitamins are necessary for energy production, immune function, blood clotting and other functions. Meanwhile, minerals play an important role in growth, bone health, fluid balance and several other processes. Micronutrients are essential elements required by organisms in varying quantities throughout life to orchestrate a range of physiological functions to maintain health. Micronutrient requirements for animals also include vitamins, which are organic compounds required in microgram or milligram amounts. There are lists of permitted food colours, emulsifies, stabilizers, preservatives and other additives that can be added to foods. Any chemical that is not on these lists cannot be used. There are also maximum levels set for each additive in specific foods and lists of foods that are able to contain specified preservatives. Contaminants, including poisonous metals such as arsenic and lead, have maximum permitted levels in specified foods. Many people enjoy making bread, cakes, wine, beer and ice cream at home. However, most of today's food bought from shops and supermarkets and has to stay in top condition over a much longer period than home-cooked food. That is why food additives have become a necessity of all types of food products and food industry.

Right from the aroma of the beverage, the texture of the food and its visual appeal, have to be enriched to make it acceptable. Additives also improve the nutritional value of some foods and can make them more appealing by improving their taste, texture, consistency or color.

Because many chemical additives are banned by food legislation and by customers, the need for natural alternatives has increased. That is why more and more additives are produced by fermentation or will be produced in future. According to the Food and Drug Administration

(FDA), a food additive in its broadest sense is any substance added to food. Legally, the term refers to "any substance the intended use of which results or may reasonably be expected to result directly

or indirectly in its becoming a component or otherwise affecting the characteristics of any food." (FDA). Additives are useful in controlling such factors as:

- Decomposition and deterioration,
- Nutritional losses,
- Loss of functional properties and Aesthetic value, but may not be used to disguise poor quality.

Vitamins and minerals are a special category of food ingredients. They are essential for nutrition but their use apart from food often is surrounded with controversy. Their use in foods has been increasing, as they have been associated with the prevention and/or treatment of at least four of the leading causes of death in the United States. Existing additives, as well as new ones, are utilized in new product development. A food additive in its broadest sense is any substance added to food. Legally, additives are classified as:

- Direct:- If they are intentionally or purposely added to foods, these direct additives must be named on food labels
- Indirect: - If indirect, they are incidentally added to food in very small amounts during some phase of production, processing, storage, packaging, or transportation.

General categories of food additives include preservatives, nutritional additives, sensory agents, and processing agents as noted below. When new food products are developed, new or existing food additives may be utilized. Additives perform a variety of useful functions in foods that are often taken for granted. Since most people no longer live on farms, additives help keep food wholesome and appealing while in route to markets sometimes thousands of miles away from where it is grown or manufacture.

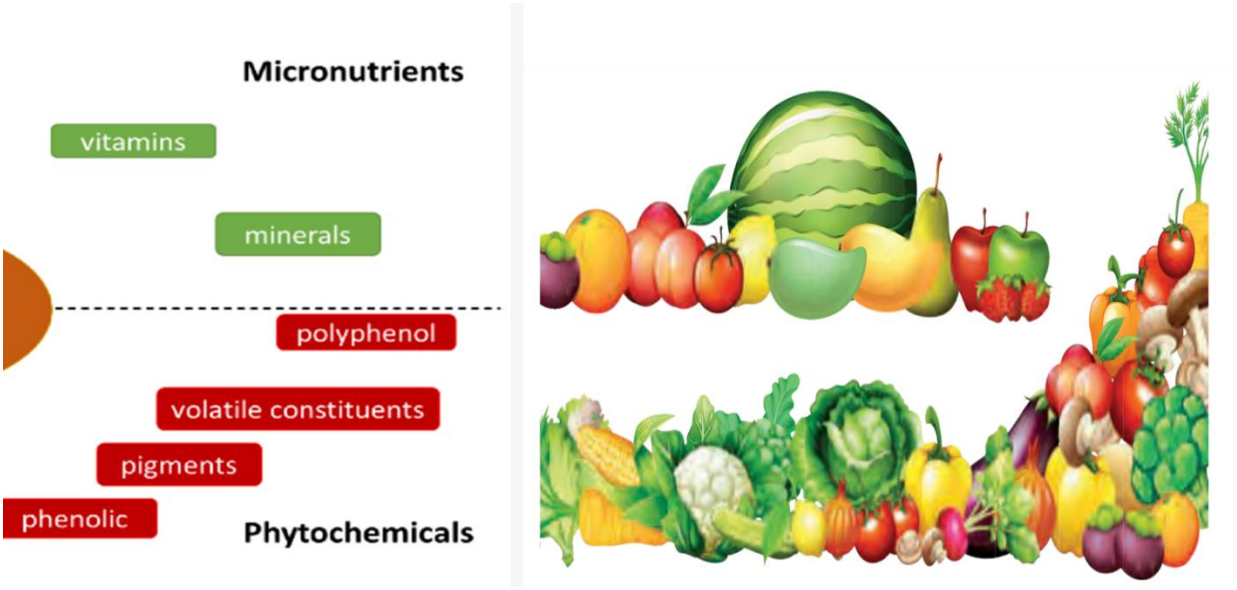


Figure 1.5: Fruit and vegetable micro nutrient

Micronutrients are essential elements required by the body for functioning. They are essential, just like macronutrients, but needed in much smaller amounts. Despite the amount needed, they are crucial for proper development, growth, enzyme production and much more. Food fortification or enrichment is the process of adding micronutrients (essential trace elements and vitamins) to food. It can be carried out by food manufacturers or by governments as a public health policy, which aims to reduce the number of people with dietary deficiencies within a population. The predominant diet within a region can lack particular nutrients due to the local soil or from inherent deficiencies within the staple foods; addition of micronutrients to staples and condiments can prevent large-scale deficiency diseases in these cases.

1.2.1 Categories of additives

Food additives divided into several groups, although there is some overlap because some additives exert more than one effect. For example, salt is both a preservative as well as a flavor. Additives

also improve the nutritional value of certain foods and can make them more appealing by improving their taste, texture, consistency or color.

Acidulents: - Acidulants confer sour or acid taste. Common acidulents include vinegar, citric acid, tartaric acid, malic acid, formic acid, and lactic acid.

Acidity regulators: - Acidity regulators are used for controlling the pH of foods for stability or to affect activity of enzymes.

Anticaking agents: - Anticaking agents keep powders such as milk powder from caking or sticking.

Antifoaming and foaming agents: - Antifoaming agents reduce or prevent foaming in foods. Foaming agents do the reverse.

Antioxidants: - These are used to protect fat from becoming rancid and fruit containing food from discoloration. Vitamins (such as A, D, E and B,) that are sensitive to degradation can also be protected by the action of antioxidants. Antioxidants such as vitamin C are preservatives by inhibiting the degradation of food by oxygen.

Bulking agents: - Bulking agents such as starch are additives that increase the bulk of a food without affecting its taste.

Food coloring: - Colorings are added to food to replace colors lost during preparation or to make food look more attractive.

Fortifying agents: - Vitamins, minerals, and dietary supplements to increase the nutritional value

Color retention agents: In contrast to colorings, color retention agents are used to preserve a food's existing color.

Emulsifiers: - Stabilizing and thickening agents, including anti-caking agents: This is an extensive group with several different compounds intended to be used in order to affect the consistency of foods. Some compounds in this group of additives have caused concern among consumers, for example the anti-caking agent sodium ferrocyanid (E 535) in salt

Flavors: - Flavors are additives that give food a particular taste or smell, and may be derived from natural ingredients or created artificially.

Flavor enhancers: - Flavor enhancers enhance a food's existing flavors. A popular example is monosodium glutamate. Some flavor enhancers have their own flavors that are independent of the food.

Flour treatment agents Flour treatment agents are added to flour to improve its color or its use in baking.

Glazing agents: - Glazing agents provide a shiny appearance or protective coating to foods.

Humectants: - Humectants prevent foods from drying out.

Tracer gas: - Tracer gas allow for package integrity testing preventing foods from being exposed to atmosphere, thus guaranteeing shelf life.

Preservatives: - Preservatives prevent or inhibit spoilage of food due to fungi, bacteria and other microorganisms.

Stabilizers emulsions: - Stabilizers, thickeners and gelling agents, like agar or pectin (used in jam for example) give foods a firmer texture. While they are not true emulsifiers, they help to stabilize

Sweeteners: - There are two main groups of sweeteners, the natural and the synthetic (artificial) sweeteners. The natural sweeteners contain energy and can be further subdivided in one group of general sugars such as glucose, sucrose and fructose, and another group of sugar alcohols, such as sorbitol and xylitol. The second group contains the synthetic sweeteners without energy, such as aspartame, ace- sulphame K, saccharin and cyclamate.

This group of artificial sweeteners has caused a lot of debate regarding safety. Sweeteners are added to foods for flavoring. Sweeteners other than sugar are added to keep the food energy (calories) low, or because they have beneficial effects regarding diabetes mellitus, tooth decay, or diarrhea.

Thickeners: - Thickening agents are substances which, when added to the mixture, increase its viscosity without substantially modifying its other properties.

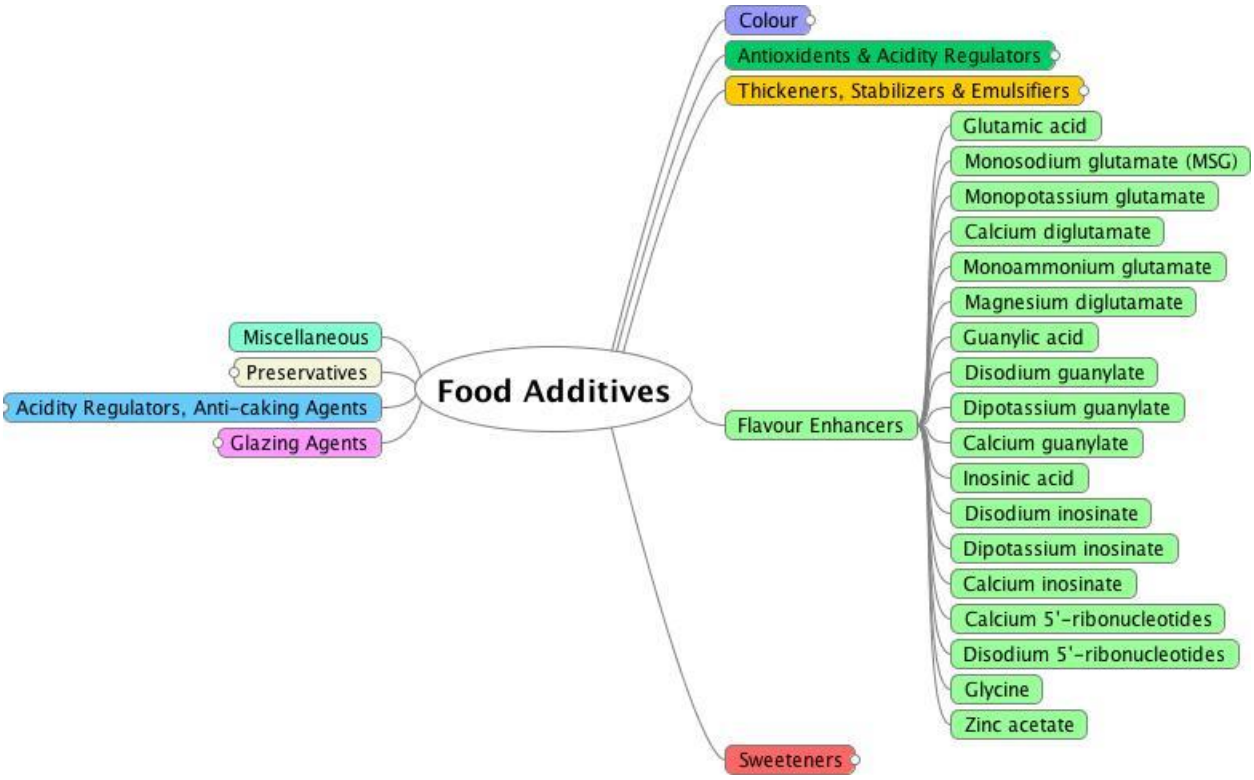


Figure 1.6: List of food additives

Generally, food additives are clearly defined in the codex general standard for food additivesas: “any substance not normally consumed as a food by itself and not normally used as a typical ingredient of the food, whether or not it has nutritive value, the intentional addition of which to food for a technological (including organoleptic) purpose in:

- Manufacture,
- Processing,
- Preparation,
- Treatment,
- Packing,
- Packaging,

Transport or holding of such food results, or may be reasonably expected to result (directly or indirectly), in it or its byproducts becoming a component of or otherwise affecting the characteristics of such foods.

1.2.2 Identifying hazards and risks

There are many definitions for hazard but the most common definition when talking about workplace health and safety is “A hazard is any source of potential damage, harm or adverse health effects on something or someone.” A hazard is something that can cause harm, e.g. electricity, chemicals, working up a ladder, noise, a keyboard, a bully at work, stress, etc.

A risk is the chance, high or low, that any hazard will actually cause somebody harm.

As identification of hazards is the first step in Risk Management, it implies that hazards, which are not identified, would not go through the rigour of the Risk Management process, leading to the non-identification of preventive measures for implementation and communication to prevent harm in the workplace. The range of hazards and risks associated with micronutrients and additives use includes:

- Cross-contamination of micronutrients and additives for different feeds and recipes.
- Wrong formula and other errors especially failure to read formula correctly
- Incorrect volume/measurement/proportion

Food contaminants typically include environmental contaminants, food processing contaminants, unapproved adulterants and food additives, and migrants from packaging materials. Environmental contaminants either are impurities that are introduced by human or occurring naturally in water, air or soil. Food processing contaminants include those undesirable compounds, which are formed in the food during baking, roasting, canning, heating, fermentation, or hydrolysis. Contamination of the food products such as meat, vegetables, and fruits is possible via the introduction of the parasite in the sewage, irrigation water, feces, soil, human handling or improper process of the infected meat. Food producing animals can itself transfer the parasites, as they are themselves infected.

Hazard identification and elimination and risk assessment and control" uses the following terms:

- Harm – physical injury or damage to health.
- Hazard – a potential source of harm to a worker.

A hazard is the potential for harm or an adverse effect (for example, to people as health effects, to organizations as property or equipment losses, or to the environment). Hazard identification is

part of the process used to evaluate if any particular situation, item, thing, etc. may have the potential to cause harm. The term often used to describe the full process is risk assessment:

- Identify hazards and risk factors that have the potential to cause harm (hazard identification).
- Analyze and evaluate the risk associated with that hazard (risk analysis, and risk evaluation).
- Determine appropriate ways to eliminate the hazard, or control the risk when the hazard cannot be eliminated (risk control).

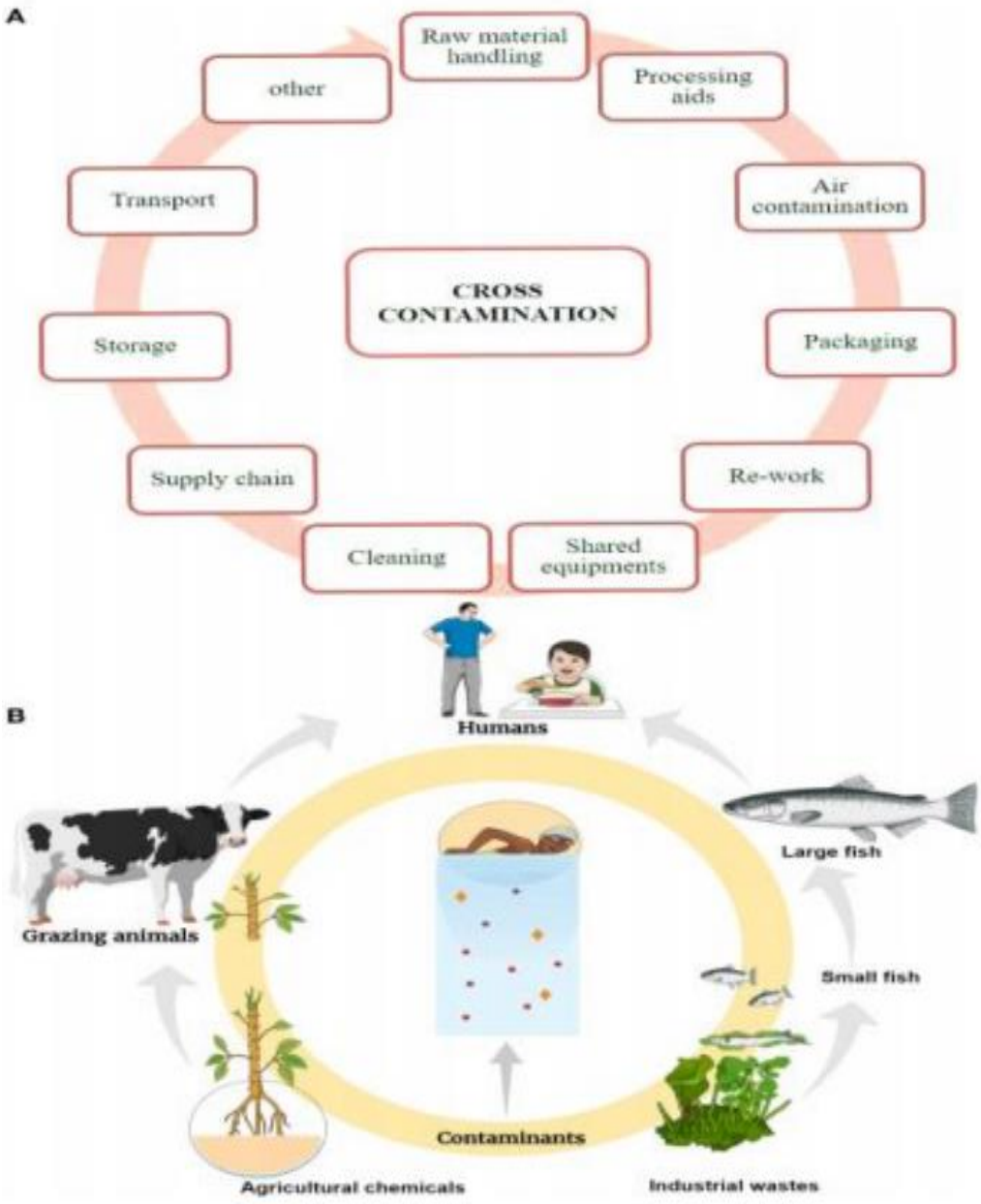


Figure 1.7: Food contamination (A) Contamination in the food production and processing. (B) Contamination due to environmental influences.

Hazards and risks

The range of hazards and risks associated with micronutrients and additives use includes:

- cross-contamination of micronutrients and additives for different feeds and recipes
- Wrong formula and other errors especially failure to read formula correctly
- Incorrect volume/measurement/proportion

Steps of identifying hazard identification and risk assessment:

- Preparation
- Hazard Identification
- Risk Assessment
- Plan Control Measures
- Record Keeping
- Implementation and Review

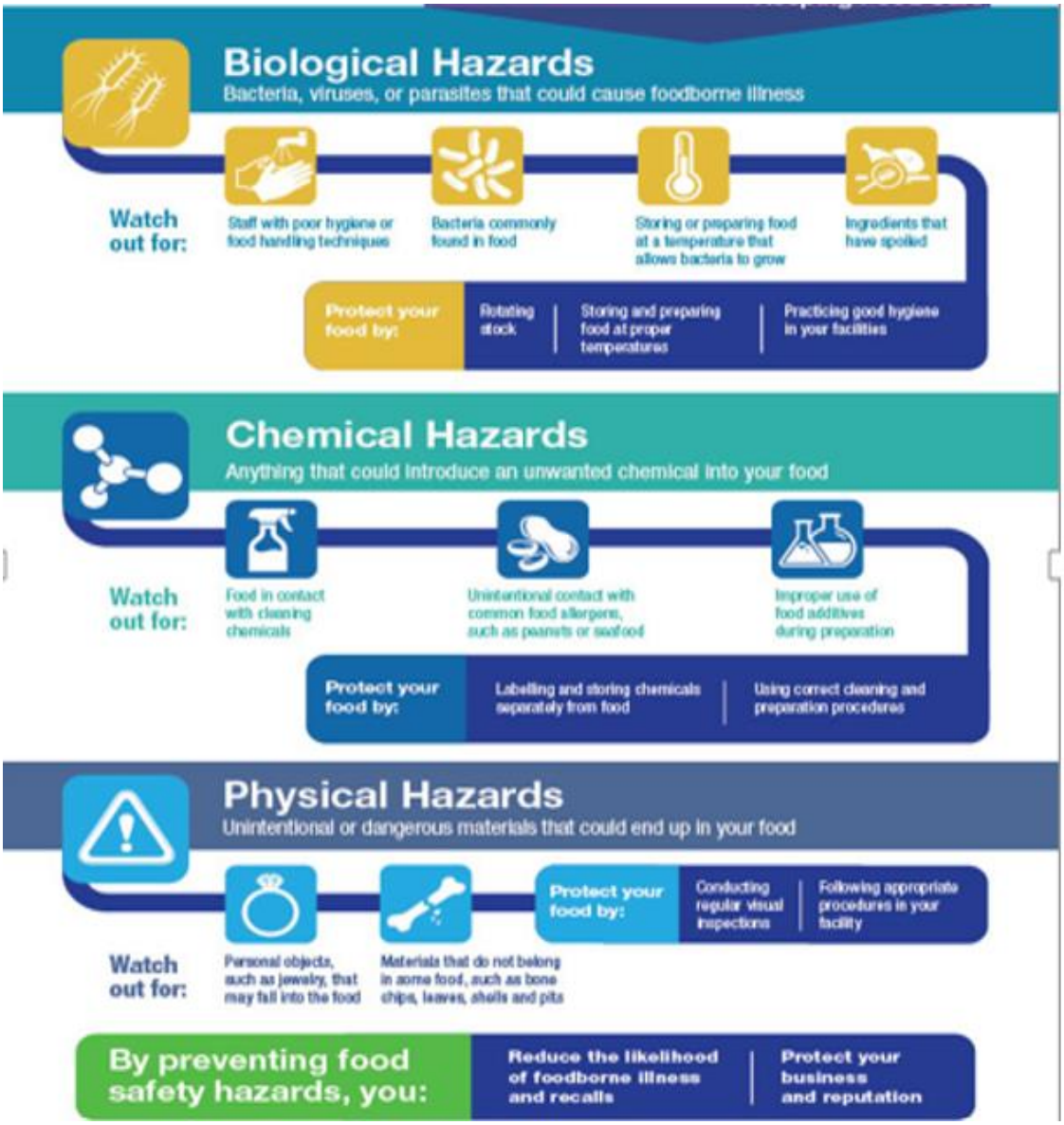


Figure 1.8: Food safety hazards and best practice

Self-check 1	Written exam

Name…… ID…… Date…

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

Test I: Write true if the statement is correct and false if the statement is incorrect

1. The production schedule outlines the specific steps and instructions for manufacturing a product.
2. The customer order provides details about the quantity, specifications, and delivery requirements of a specific product requested by a customer.
3. The Standard Operating Procedure (SOP) specifies the planned sequence of production for various fruits and vegetables within a specific timeframe.
4. The production schedule provides step-by-step instructions for performing a specific task or operation in the manufacturing process.
5. The customer order provides information about the raw materials, components, and quantities required to manufacture a fruit or vegetable product

Test II: Choose the best answer among the given alternative

1. Which document specifies the planned sequence and timing for processing different fruits and vegetables in a manufacturing facility?
   a) Production schedule
   b) Customer order
   c) Standard Operating Procedure (SOP)
   d) Bill of materials
2. What document provides details about the specific quantity, type, and quality requirements of fruits and vegetables requested by a customer?
   a) Production schedule
   b) Customer order

c) Standard Operating Procedure (SOP)

d) Work instruction

3. Which document outlines the step-by-step instructions for handling, processing, and packaging specific fruits and vegetables in a manufacturing facility?

   a) Production schedule

   b) Customer order

   c) Standard Operating Procedure (SOP)

   d) Process flowchart

4. What document provides information about the raw materials, ingredients, and packaging materials required for processing fruits and vegetables?

   a) Production schedule

   b) Customer order

   c) Standard Operating Procedure (SOP)

   d) Bill of materials

5. Which document specifies the time, date, and location for the delivery of processed fruits and vegetables to the customer?

   a) Production schedule

   b) Customer order

   c) Standard Operating Procedure (SOP)

   d) Delivery schedule

Test III: Write short answer for the following questions

1. What is micro nutrient/additives?-
2. List the categories of additives?
3. Write down the term often used to describe the full process is risk assessment?
4. What is hazards identification?

Operation Sheet 1

1.1 The procedure of process of fruit and vegetable manufacturing

Objective:

The objective of fruit and vegetable manufacturing is to convert fresh fruits and vegetables into various food products

A. Equipment and tools:

- Washing Equipment (Industrial washing machines, water baths, or spray systems)
- Cutting and Slicing Equipment: Knives, blades, or specialized cutting machines
- Blanching Equipment: Steam blanchers or water blanchers
- Processing Equipment: Crushers, mills, blenders, or food processors, depending on the desired product
- Cooking and Heating Equipment: Industrial cookers, steamers, ovens, or fryers may be used for cooking or heating fruits and vegetables to achieve desired flavors, textures, or product characteristics.
- Packaging Equipment: Packaging equipment includes machines for filling, sealing, labeling, and packaging the finished products.
- Quality Control Equipment: pH meters, thermometers, or moisture analyzers
- Storage and Distribution Equipment: refrigeration units, freezers, or cold storage facilities to store the finished products before distribution.

B. Procedure:

- Inspect, sort and grade the fruits and vegetables based on factors such as size, quality, and ripeness.
- Wash fruit and vegetable to remove dirt, debris, and any surface contaminants.
- Peel or Trim fruits and vegetables to remove the outer skin or unwanted parts like stems, leaves, or cores.
- Cut or sliced produce into desired shapes and sizes

- Blanch or immerse the fruits or vegetables in boiling water or steam
- Puree, grind, crush, or mill the fruits or vegetables to create pastes, pulps, or extracts.
- Cook or heat to achieve the desired flavor, texture, or preservation.
- Add ingredients depending on the recipe, various ingredients like sugar, salt, spices, acids, or preservatives
- Pack the final product in suitable containers, such as cans, jars, bottles, or pouches.
- Label and proper labeling is applied to the packaging, including product information, nutritional facts, and expiration dates.
- Stored in appropriate conditions to maintain their quality

1.2 Procedure of Identifying hazards and risks

Objective:

The objective of the procedure for identifying hazards and risks is to systematically assess and understand potential hazards and risks in order to implement appropriate control measures and ensure the safety of workers, the environment, and the public.

Equipment's and tools:

- Personal Protective Equipment (PPE)

Procedure:

- Collect relevant information about the manufacturing process
- Assemble a team of individuals with relevant expertise, such as safety officers, supervisors, and employees familiar with the manufacturing process.
- Conduct a thorough walkthrough of the manufacturing facility, observing each step of the process.
- Identify and document potential hazards, including physical, chemical, biological, ergonomic, and environmental hazards.
- Evaluate the risks associated with each identified hazard.
- Prioritize the identified hazards and risks based on their potential severity and likelihood.
- Develop and implement control measures to mitigate the identified hazards and risks
- Document the hazard and risk assessment findings, including the identified hazards, risk assessments, and control measures.

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: Develop a procedure for the process of fruit and vegetable manufacturing

Task 2: Conduct a hazard and risk assessment for the manufacturing process

LG #29	LO2# Obtain correct micronutrient or other additive

Instruction sheet

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

- Identifying Storage location for micronutrient or additive.
- Obtaining Micronutrient or additive with standard operating operation (SOP).
- Labeling Micronutrient or additive to determine any special mixing, handling or OHS requirements

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:

- Identify Storage location for micronutrient or additive.
- Obtain Micronutrient or additive with standard operating operation (SOP).
- labeled Micronutrient or additive to determine any special mixing, handling or OHS requirements

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” If

Information sheet 2

2.1 Identifying Storage location for micronutrient or additive

2.1.1. Micronutrient or additive storage location

Micronutrients and additives may range from common proprietary products to specific micronutrients and additives prescribed by veterinarians or covered by legislative requirements. Food additives are substances added to food to preserve flavor or enhance its taste, appearance, or other qualities. Some additives have been used for centuries; for example, preserving food by pickling (with vinegar), salting, as with bacon, preserving sweets or using sulfur dioxide as with wines. Products should be stored off the floor in a cool, dark storeroom that has good ventilation and protection against insects and rodents. QA systems should also monitor the time that they remain in storage. Records should show which materials are transferred into and out of the storeroom and when they are used or sold. A First In/First out (FIFO) system of stock control should be used. It should apply to raw materials, other ingredients and finished products. Processors should also monitor and control distribution to retailers and storage/display in retail outlets. There are five methods of storing vegetables and fruit product and by-products:

- Drying,
- Canning,
- ✓ Curing and salting,
- ✓ Freezing and common storage.

Which method is chosen depends upon the type of produce, the quality desired and the facilities available for storage. Nutritional recommendations emphasize fruit and vegetable consumption. A general rule for vegetables is that cool-season crops should be stored at cooler temperatures (32 to 35°F), and warm-season crops should be stored at warmer temperatures (45 to 55°F).

Most fruits and vegetables will resist disease as long as the skin is intact.

- Before storage, carefully inspect produce for cuts, bruises and signs of decay.
- Maintaining the correct moisture level is also important.

Successful Storage Begins in the Garden;

- Harvest early in the day, but after dew is gone
- Gently remove soil
- Sort produce
- Wash, if necessary, and dry

Maximizing Storage Life:

- Maintain moisture but not too much!
- Remove diseased produce
- Store at ideal temperature avoid
- Temperature extremes
- Cold moist 32F-40F 95 humidity (apples,broccoli, spinach)
- Cold dry 32F-40F 65 humidity(onions,garlic)
- Cool and dry 50F-60F 60 humidity (winter squash, pumpkins)

Storage Compatibility

- Beware of strong odors don't store cut onions near apples or potatoes
- Ethylene-producing fruits can damage other produce don't store apples near lettuce, asparagus, beans
- Humidity and temperature requirements can vary

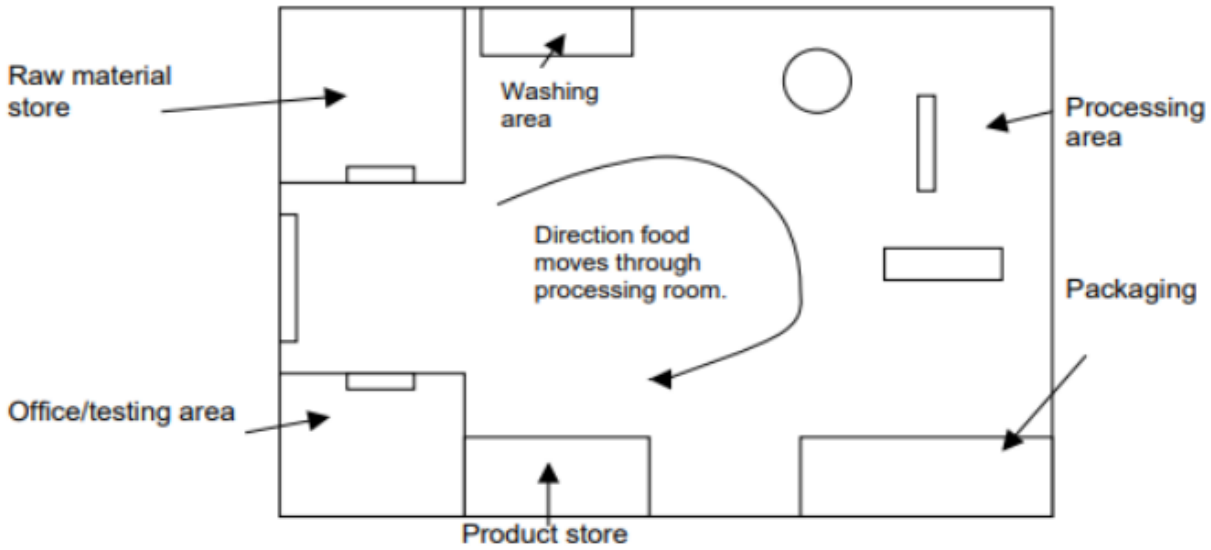


Figure 2.1: General guideline for storing product/by product of fruit/vegetable

Storeroom doors should not have gaps beneath them and should be kept closed to prevent insects and rodents from getting in and destroying stocks of product, ingredients or packaging materials. Processing room doors should be kept closed unless they are fitted with thin metal chains, or strips of plastic or cloth hung from door lintels. These keep out insects and birds, but allow easy access for staff. Alternatively, mesh door screens can be fitted.

2.2 Obtaining Micronutrient or additive with standard operating operation (SOP)

2.2.1. Obtain micronutrient or additive

Micronutrients are defined as substances in foods that are essential for human health and are required in small amounts. They include all of the known vitamins and essential trace minerals. Micronutrient malnutrition affects a third to a half of the global population. It causes untold human suffering and levies huge costs on society in terms of unrealized human potential and lost economic productivity. Vitamins are necessary for energy production, immune function, blood clotting and other functions. Meanwhile, minerals play an important role in growth, bone health, fluid balance and several other processes. Many people enjoy making bread, cakes, wine, beer and ice cream at home. However, most of today's food is bought from shops and supermarkets and has to stay in top condition over a much longer period than home-cooked food.

That is why food additives have become a necessity of all types of food products and food industry. Right from the aroma of the beverage, the texture of the food and its visual appeal, have to be enriched to make it acceptable. Additives also improve the nutritional value of some foods and can make them more appealing by improving their taste, texture, consistency or color. Because many chemical additives are banned by food legislation and by customers, the need for natural alternatives has increased. That is why more and more additives are produced by fermentation or will be produced in future. Many industrially processed foods contain additives that are in fact natural or nature-identical micronutrients. Their purpose is to improve the consistency of the food and to give it certain characteristics. Micronutrients play a central role in metabolism and in the maintenance of tissue function, but effects in preventing or treating disease, which is not due to micronutrient, deficiency cannot be expected from increasing the intake.

Micronutrients or additives

Micronutrients and additives may range from common proprietary products to specific micronutrients and additives prescribed by veterinarians or covered by legislative requirement.

Food additives are substances added to food to preserve flavor or enhance its taste, appearance, or other qualities. Some additives have been used for centuries:

- preserving food by pickling (with vinegar),
- salting, as with bacon,
- Preserving sweets or using sulfur dioxide as with wines.

Additives are selected based on their primary function in the finished food product.
Micronutrients are usually used as antioxidants:

- To prevent oxidative processes that impair food quality and
- Coloring agents to compensate for color lost during processing.

Food additives have an essential role in the current industry and consumption habits, as they not only make food products more appealing, but they increase their stability and inherent safety. Overall, food additives may be defined as compounds/extracts that are added to a food product in order to accomplish a specific technological goal but are not ingested as a food product themselves According to the European Food Safety Agency (EFSA), an additive must not pose a safety concern for the consumers health (when ingested) while fulfilling a specific technological need that cannot be satisfied through other reasonable means. Examples of these needs are the enhancement of the sensory quality, the fulfillment of specific dietary needs, or the ease of production, packaging, transport, and/or storage of food products.

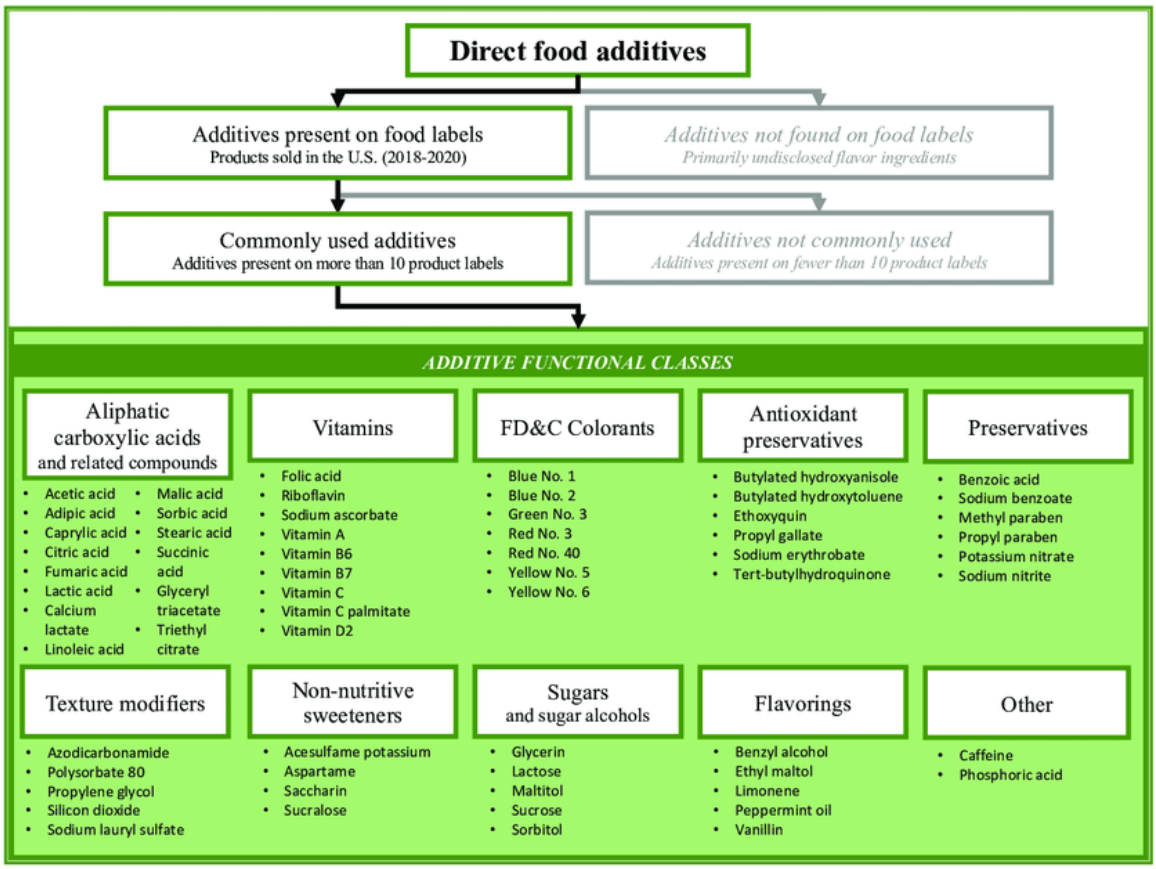


Figure 2.2: Food additives and functional class

Overall, in the EU, the use of additives (non-enzymatic) is regulated by European Commission (EC) No 1333/2008 with the additives, the list of allowed additives, and subsequent limitations always dependent on the appearance of new evidence regarding their safety. In this legislation, the different groups are defined along with rules on how an additive must be referred to in a product (e.g., the information must be present in the label with the compounds referred to either by their name or their E-number and by the function they play in the final product). Moreover, food additives must follow specific purity criteria that are described in three different directives:

- Directive 2008/60/EC for sweeteners;

- Directive 2008/128/EC for colors; and
- Directive 2008/84/EC for other additives.

After the inclusion of the list of approved additives and food carriers (and the conditions associated with their use) into Regulation (EC) No 1333/2008, a revision of the purity criteria of food additives was undertaken, resulting in a new regulation, Regulation (EU) No

231/2012 that repealed the previous directives for sweeteners, colors, and other additives

Generally, term food additive means any substance the intended use of which results or may reasonably be expected to result, directly or indirectly, in its becoming a component or otherwise affecting the characteristics of any food (including any substance intended for use in producing, manufacturing, packing, processing, preparing, treating, packaging, transporting, or holding food; and including any source of radiation intended for any such use).

Foods that are rich in micronutrients include:

- Dark leafy greens
- Any fruit or vegetable
- Raw nuts & seeds
- Animal protein that is void of GMOs, antibiotics, or hormones
- Whole free range eggs
- Herbs & Spices such as: Oregano, Thyme, Rosemary, Turmeric, Sea Salt, Clove, Ginger, Cinnamon

Important Supplements might include:

- Omega 3 Fatty Acids
- Vitamin D
- Probiotic
- Vitamin B Complex

2.3 Labeling Micronutrient or additive to determine any special mixing, handling or OHS requirements

2.3.1 Labeling Micronutrient or additive to determine

Food labels are labels on packaged food products that tell you: what ingredients and additives are in the food how to store the food who manufactured the food.

Nutrition information panels (NIPs) are a part of food labels. These tell you what key nutrients the food contains and how much of each nutrient there.

All packaged food products have food labels, except for: very small packets fresh foods like fruit and vegetables foods made and packaged at the point of sale – for example, bread from bakeries foods sold at fundraising events packaged water, tea, coffee, herbs and spices.



Figure 2.3: Some Micronutrient Labeling Information

Ingredients on food labels

Food manufacturers must be truthful on their food labels. A food label can include only the ingredients that are in the food. For example, strawberry yoghurt must contain strawberries.

The label also has to list the amount of an ingredient if it's mentioned in the food's name or emphasized in its packaging. This information is in the ingredient list, where it will be written as a percentage – for example, 'strawberries (20%)'.

All ingredients must be listed in descending order by weight, including added water. The ingredient listed first is the one that was present in the largest amount when the product was manufactured. So if sugar is the first ingredient, it means that sugar is the main ingredient and the product is probably high in sugar. The ingredient listed last was present in the smallest amount.

Food additives

Many foods contain food additives. There are strict guidelines about the way food additives are used in foods and labelled on food products. For most packaged foods, all food additives must be shown on the ingredient list – for example, thickener (1442). The label must say if an additive is based on a potential allergen – for example, wheat thickener.

Food additives play an important part in our food supply ensuring our food is safe and meets the needs of consumers.

Food additives can be used to improve the taste or appearance of a processed food. For example, beeswax - glazing agent (901) may be used to coat apples to improve their appearance improve the keeping quality or stability of a food. For example, sorbitol - humectant (420) may be added to mixed dried fruit to maintain the moisture level and softness of the fruit preserve food when this is the most practical way of extending its storage life. For example, sulphur dioxide - preservative (220) is added to some meat products such as sausage meat to limit microbial growth.

Many substances used as additives also occur naturally, such as vitamin C or ascorbic acid (300) in fruit, or lecithin (322), which is present in egg yolks, soya beans, peanuts and maize. The human

body cannot distinguish between a chemical naturally present in a food and that same chemical present as an additive.

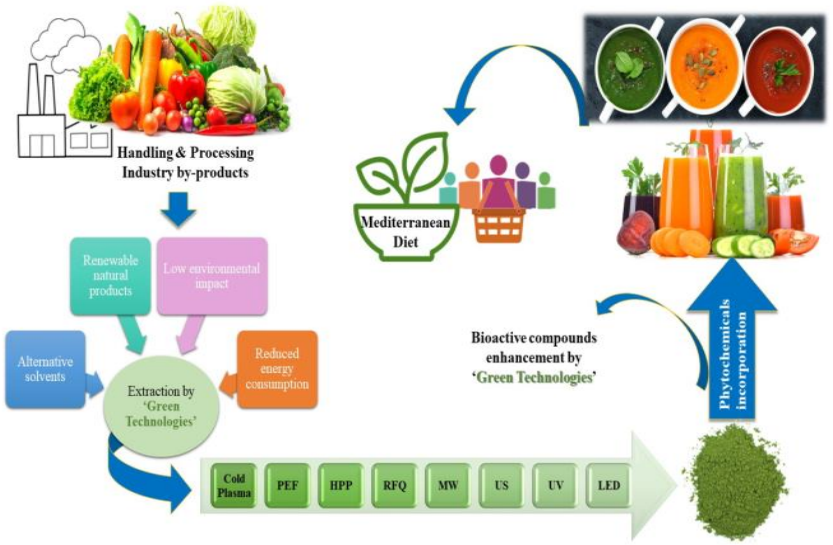


Figure 2.4: Food additive cycle

Labeling

Food additives in most packaged food must be listed in the statement of ingredients on the label.

Most food additives must be listed by their class name followed by the name of the food additive or the food additive number, for example, Colour (Caramel I) or Colour (150a). Most flavouring substances can be identified as either 'flavouring' or 'flavour', or by a more specific name or description. Enzymes may be identified as 'enzyme' and the specific name of the enzyme does not need to be listed.

Additives banned overseas

There are sometimes reports that additives are banned overseas when they haven’t been banned at all. In some cases manufacturers in these countries haven’t ever applied to use certain additives

because there are alternatives they can use. In other cases policy decisions are made, like applying a warning statement, which are not based on scientific safety assessments.

Some additives were banned many years ago, and scientific evidence since then has proven them to be safe.

Food intolerances

Adverse reactions to food additives occur in a small proportion of the population. Intolerances can be to natural or synthetic sources. The labeling of food products helps people who are sensitive to some food additives to avoid them.

2.3.2 Read micronutrient or additive label

The Nutrition facts panel is part of the label on a food package. It is where you look to find out the amounts of carbohydrates, calories, fat, protein, vitamins, and minerals in the food. This information can help you know whether a food fits well with your meal plan.

Read labels on food to identify:

- target and non-target species
- dose /addition level
- withholding period
- expiry dates
- storage and handling requirements
- manufacturer's name
- product and active ingredient name





Figure 2.5: Reading label of micro nutrients/additives

General standard for labeling of pre-packed foods' that describes the information that must be included on a label, but there are also detailed laws concerning the following aspects:

- Specific names that must be given to different types of ingredients,
- Ingredients that are exempt from the law,
- The use of words such as best before and sell by,
- The declaration of alcohol content on spirit drinks,
- Locations of the name of the food,
- The sell-by date and the net weight (they must all be in the same field of vision when a customer looks at the label),
- The visibility of information and the ability of customers to understand it (including the relative print sizes of different information),
- Claims and misleading descriptions,
- Especially about health-giving or tonic properties,
- Nutritional advantages,
- Diabetic or other medicinal claims,
- Specifications of the way in which certain words such as flavour, fresh, vitamin etc.

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 answer among the given alternative

1. What is the physical form of the micronutrient or additive?
   a) Liquid
   b) Powder
   c) Solid
   d) All of the above

2. What are the specific storage requirements or recommendations for the micronutrient or additive?
   a) Refrigeration
   b) Controlled temperature
   c) Specific environmental conditions
   d) All of the above
3. Are there any compatibility considerations for storing the micronutrient or additive?
   a) Yes, it should be kept away from certain substances or materials
   b) No, it can be stored alongside any other materials
4. Are there any safety or regulatory guidelines that dictate storage practices for the micronutrient or additive?
   a) Yes, there are specific storage restrictions or requirements outlined by regulatory authorities
   b) No, there are no specific guidelines for storage
5. Who is responsible for handling and storing the micronutrient or additive?
   a) Production department
   b) Quality control personnel
   c) Warehouse staff
   d) All of the above
6. Are there any specific labeling or documentation requirements for the storage location of the micronutrient or additive?
   a) Yes, it needs to be clearly labeled and documented in inventory records
   b) No, there are no specific labeling or documentation requirement

Test II: Write true if the statement is correct and false if the statement is incorrect

1. The physical form of the micronutrient or additive can be liquid, powder, or solid.

2. Specific storage requirements for micronutrients or additives may include refrigeration, controlled temperature, or specific environmental conditions.
3. Compatibility considerations should be taken into account when storing micronutrients or additives.
4. Safety and regulatory guidelines may dictate storage practices for micronutrients or additives.
5. The responsibility for handling and storing micronutrients or additives lies solely with the production department.
6. There are specific labeling and documentation requirements for the storage location of micronutrients or additives.

Test III: Write short answer for the following questions

1. What are the possible physical forms of the micronutrient or additive that need to be stored?
2. What are the specific storage requirements for the micronutrient or additive? (e.g., temperature, humidity, light conditions)
3. Are there any compatibility considerations for storing the micronutrient or additive? If so, what substances or materials should it be kept away from?
4. Are there any safety or regulatory guidelines that dictate storage practices for the micronutrient or additive? If yes, please specify.
5. Who is responsible for handling and storing the micronutrient or additive?
6. Are there any specific labeling or documentation requirements for the storage location of the micronutrient or additive?

Operation Sheet 2

2.1 Procedure for micronutrient or additive storage location

Objective: To establish a procedure for the storage of micronutrients or additives in a controlled and organized manner

Procedure:

- Determine storage requirements
- Designate a storage area
- Organize storage space
- Implement FIFO (First-In, First-Out) System
- Packaging and containment
- Safe handling and transportation
- Regular inspections and maintenance
- Documentation and inventory control

LAP TEST-2	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: Conduct an audit of micronutrient or additive storage locations

LG #30	LO3 #Add micronutrient or additive to product

Instruction sheet

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

- Matching Micronutrient or additive to product.
- Determining appropriate volume, measurement or proportion of micronutrient or additive.
- Undertaking Pre-mixing or other micronutrient or additive preparation procedure
- Adding Micronutrient or additive to stock feed at appropriate location and stage of production process.
- Following Appropriate contamination, quality and sequencing procedures
- Taking Stock feed samples to procedures.
- Conducting Work with workplace environmental guidelines.

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:

- Matching Micronutrient or additive to product.
- Determining appropriate volume, measurement or proportion of micronutrient or additive.
- Undertaking Pre-mixing or other micronutrient or additive preparation procedure
- Adding Micronutrient or additive to stock feed at appropriate location and stage of production process.
- Following Appropriate contamination, quality and sequencing procedures
- Taking Stock feed samples to procedures.
- Conducting Work with workplace environmental guidelines

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” If

Information Sheet 3

3.1 Matching micronutrient or additive to product

3.1.1. Match micronutrient or additive to product

In food processing, it adding appropriate amount of micronutrients and additive are important, unless it causes problems on human health. Food fortification or enrichment is the process of adding micronutrients (essential trace elements and vitamins) to food. It can be carried out by food manufacturers or by governments as a public health policy, which aims to reduce the number of people with dietary deficiencies within a population. The predominant diet within a region can lack particular nutrients due to the local soil or from inherent deficiencies within the staple foods; addition of micronutrients to staples and condiments can prevent largescale deficiency diseases in these cases.

Utilization of those by-products as a valuable source of natural food additives appears to be a good alternative toward mitigation of environmental problems and for further exploitation of food additives or supplements having high nutritional value and economically attractive. Fruits and vegetables may be incorporated in different raw or cooked, fresh or processed forms: canned, pickled, dried, frozen, candied, and in sauces, purees or preserves. Juices are good sources of phytochemicals and vitamins and can contribute to the overall fruit and vegetable intake. However, they contain less fiber than unprocessed commodities and may contribute extra calories if sugar is added. Care must be taken regarding added salt in processed vegetable products, since they may contribute up to one-third of the total dietary sodium intake.

Fortification is the practice of deliberately increasing the content of an essential micronutrient, i.e. vitamins and minerals (including trace elements) in a food, to improve the nutritional quality of the food supply and provide a public health benefit with minimal risk to health. Natural products provide unlimited opportunities for new drug leads because of the unmatched availability of chemical diversity. Fruit and vegetable peels are thrown into the environment as agro waste which

can be utilized as a source of anti-microbes. However, there is currently no major exploitation of these sources, due to the poor understanding of their nutritional and economic value, adding that there is a great opportunity for agribusiness in the area.

A food additive in its broadest sense is any substance added to food. Legally, additives are classified as direct or indirect. If they are intentionally or purposely added to foods, these direct additives must be named on food labels. If indirect, they are incidentally added to food in very small amounts during some phase of production, processing, storage, packaging, or transportation. In addition, pineapple, taro, papaya, and mango are typically appreciated for their flesh but processing of these crops involves separation and removal of the skin and seed byproducts. Use of additives:

- Maintain product consistency
- Improve or maintain nutritional value
- Maintain palatability and wholesomeness
- Provide leavening or control acidity/alkalinity
- Enhance flavor or impart desired color.

3.1.2. Composition and functional compounds of fruit and vegetable by products

Chemical composition

The amount of pollution load and characteristics of the waste depend on the food being processed. Chemical composition of the wastes from fruits and vegetables show that it is a rich source of various nutrients. Some of these fruit and vegetable wastes are a rich source of vital constituents like carbohydrates, proteins, fats, minerals, fibers etc.

Occurrence of functional compounds

The most common bioactive compounds present in fruits and vegetables are vitamins C, E, carotenoids, phenolic compounds and dietary fiber.

Potential of fruit by-products as a source of food additives

Fruit production, trade and consumption have increased significantly on the domestic and international markets due to their attractive sensory properties and a growing recognition of its nutritional and therapeutic value. Likewise, tropical crops such as pineapple, taro, papaya, and mango are typically valued for their fruit. Processing of these crops typically involves separating the valuable fruit part from byproducts such as skin and seeds. Fruit by products have a potential role in food industry; where one of the majors can be as food additives (antioxidants, antimicrobials, colorants, flavorings, and thickener agents). Vitamin C, a natural compound obtained from several plant tissues is the best example of the potential use in the food industry.

Potential of vegetables by-products as a source of food additives

The amount of vegetable residues generated after harvesting the edible portion of most crops can account for a large proportion depending on the plant. Traditionally, agro-industrial waste has been used as a feed or as a fertilizer. However, vegetable by-products are an important resource as a raw material for potential use in food additives or dietary supplements and as a source of extractable polysaccharides for industrial exploitation.

3.2. Determining appropriate volume, measurement or proportion of micronutrient or additive

3.2.1 Determine appropriate volume of micronutrient

It is an international expert scientific committee that is administered jointly by the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO). Micronutrients are one of the major groups of nutrients your body needs. They include vitamins and minerals. Vitamins are necessary for energy production, immune function, blood clotting and other functions. Meanwhile, minerals play an important role in growth, bone health, fluid balance and several other processes. The dietary requirement for a micronutrient is defined as an intake level that meets specified criteria for adequacy, thereby minimizing risk of nutrient deficit or excess. These criteria cover a gradient of biological effects related to a range of nutrient

intakes, which, at the extremes, include the intake required to prevent death associated with nutrient deficit or excess.

Micronutrients are vitamins, minerals, and trace elements that are critical to energy metabolism, cellular growth and differentiation, organ function, and immune function.

Vitamins such asthiamine, riboflavin, niacin, biotin, pantothenic acid, and folate (B vitamins), as well as vitamin K, can be synthesized by the micro biota under the food additives amendment, two groups of ingredients were exempted from the regulation process.

GROUP I – Prior sanctioned substances are substances that FDA or USDA had determined safe for use in food prior to the amendment. Examples are sodium nitrite and potassium nitrite used to preserve luncheon meats.

GROUP II - GRAS (generally recognized as safe) ingredients are those that are generally recognized by experts as safe, based on their history of extensive use in food before 1958 or based on published scientific evidence. Among the several hundred GRAS substances, one finds salt, sugar, spices, vitamins and monosodium glutamate (MSG). Manufacturers may also request that FDA review the industry's determination of GRAS Status. The Food and Drug

Administration (FDA) maintains a list of over 3000 ingredients in its data base "Everything

Added to Food in the United States" available General categories of food additives include preservatives, nutritional additives, sensory agents, and processing agents as noted below.

When new food products are developed, new or existing food additives may be utilized.

Table .Amount of required additives per food

	Type of food/product	Name of addiives	Max Permitted Level/Amount added
	Citrus fruit	Oxidised polyethylene Propylene glycol	250 mg/kg 30000 mg/kg

	Dried fruits and vegetables	Sorbic acid and sodium, potassium and calcium sorbates	1000 mg/kg
	Commercially sterile fruits and vegetables in hermetically sealed containers	Acesulphame potassium Cyclamates Saccharin	500 mg/kg 1350 mg/kg 110 mg/kg
	Fruit and vegetable spreads including jams, chutneys and related products	Acesulphame potassium	3000 mg/kg
		Cyclamates	1000 mg/kg
		Saccharin	1500 mg/kg
		Alitame	300mg/kg
	fruit and vegetable preparations for manufacturing purposes	Sulphur dioxide and sodium and potassium sulphite	1000 mg/kg

Generally, micronutrients /additives may range from common proprietary products to specific micronutrients and additives prescribed by veterinarians or covered by legislative requirements.

3.3 Undertaking Pre-mixing or other micronutrient or additive preparation procedure

3.3.1. Introduction

Raw materials and premixes were analyzed for their chemical composition. Premixes were incorporated to unleavened flat bread at 6 and 12% levels and evaluated for nutritional and sensory quality. Results indicated that premixes were rich sources of protein, iron, calcium, total and β-carotene, dietary fiber and bioactive components. They are used for a variety of reasons: to maintain freshness during storage or transportation, to add nutrients or increase the nutritional level, to have a more appealing appearance or taste, or to make processing easier. Food additives are mostly synthetic chemicals but many are natural. Additives like vitamins, enzymes, or amino acids as well as premixes play a key role in ensuring optimum feed for livestock. Only additives that are approved for animal nutrition in accordance with

Regulation (EC) No. 1831/2003 may be used.

With the advent of food processing, food additives play an important role in providing a safe food supply as well as meeting the consumers' need. Food additive means any substance, either natural or synthetic, intentionally added to food for a technological purpose in the processing, packaging, transport or storage of such food.

1. The technological functions of food additive include but not limited to the following:

- Enhancing the safety and quality by the inhibition of microbial growth;
- Extending the shelf-life by protection against any oxidative deterioration;
- Enhancing the flavour and odour;
- Stabilizing or retaining the colour; and
- Improving the texture and consistency of a food, etc.

2. Food additive is not normally consumed as a food by itself and not normally used as a typical ingredient of the food. The term does not include contaminants or substances

Added to food for maintaining or improving nutritional qualities as well as seasonings such as salts, herbs and spices

3. There are many types of food additives and the commonly used ones include:

a. Preservatives,
b. Antioxidants,
c. Sweeteners,
d. Colouring matters,
e. Flavour enhancers,
f. Thickeners,
g. Emulsifiers

The present invention is an additive preparation for use in bodily fluid collection devices. The additive preparation has an additive, an organic acid and a metal carbonate compound. The preparation effervesces when in contact with a body fluid sample, thereby efficiently dispersing in a body fluid sample. The formulation is desirably tabulated to provide an effective, easily stored, and handled preparation. However, a binding or bulking agent may be added to the additive preparation formulation to provide binding and lubricating properties to the formulation.

Food Additives - Submission Preparation

Food additive submissions

A food additive submission is the term used to refer to a request, accompanied by supporting information, to enable the use of a food additive in retail food in Canada. Submissions take the form of a cover letter explaining the nature of the request and an information package containing specific types of information that must be assessed by Health Canada before steps can be taken to permit the requested use. The person, company, or agent making the request is referred to as a "petitioner".

Standard form or format for food additive submission

There is no set format for making food additive requests but there are certain types of information that should be included in the submission, as explained below. A "Food Additive Submission Checklist" should also be included with the submission package. The checklist is a tool intended

to assist the petitioner in assembling the submission package and to assist Health Canada in verifying that the submission package contains the required information that will allow a safety evaluation to be initiated.

Different types of food additive submissions

The nature of the requests found in food additive submissions varies, but the requests can generally be described as listed below.

- Requests for the use of a "new" food additive A "new" food additive is one that had never before been approved for use in retail foods in Canada.
- Requests to "extend the use" of an already-permitted food additive
- Listings of permitted food additives include the common name of the food additive, a list of the foods in which the additive may be used, and the maximum level of use. Therefore, a food additive submission is required in order for Health Canada to consider any requests to extend the list of foods in which a food additive may be used.
- Requests to change the "maximum level of use" of an already-permitted food additive As is the case for requests to extend the use of a food additive, a food additive submission is required in order for Health Canada to consider any requests to change the maximum level of use of a food additive.
- Requests to add a new organism to the list of permitted sources of enzymes used as food additives

Enzymes are produced by living organisms. Enzymes that are used in the food industry are often obtained from bacteria and fungi. When an enzyme is used as a food additive, not only is the enzyme evaluated by Health Canada, but the enzyme source is also evaluated. Both the enzyme and its permitted sources are listed in the List of Permitted Food Enzymes. Therefore, a request to extend the list of permitted source organisms for a particular enzyme must be made in the form of a food additive submission.

Safety and Public Health Significance

1. The toxicity of food additives is generally low. The major food safety concern of food additives is in fact due to their chronic exposure at levels above the safety reference.
2. The Joint Food Agriculture Organization / World Health Organization Expert Committee on Food Additives (JECFA) is the international food safety authority responsible for collecting and evaluating scientific data on food additives and allocate a safety reference (i.e. acceptable daily intake (ADI)) to the food additives evaluated. JECFA also makes recommendations on safe levels of use.
3. The ADI of a chemical is the estimate of the amount of a substance in food or drinking water, expressed on a body-weight basis that can be ingested daily over a lifetime without appreciable health risk. A dietary intake above the ADI does not automatically mean that health is at risk. Transient excursion above the ADI would have no health consequences provided that the average intake over long period is not exceeded as the emphasis of ADI is a lifetime exposure.
4. A small proportion of the population may be intolerant to some food additives and may have acute effects, e.g., small amount of sulphur dioxide may cause bronchoconstriction and asthmatic reaction people with allergic conditions.

3.4 Adding Micronutrient or additive to stock feed at appropriate location and stage of production process.

3.4.1. Add micronutrient or additive to product Food fortification

has been defined as the addition of one or more essential nutrients to a food, whether it is normally contained in the food, for the purpose of preventing or correcting a demonstrated deficiency of one or more nutrients in the population or specific population groups. Other terminology exists for the addition of nutrients to foods. Restoration means the addition to a food of essential nutrients, which are lost during the course of Good Manufacturing Process (GMP), or during normal storage and handling procedures, in amounts, which will result in the presence in the food of the levels of the nutrients present in the edible portion of the food before processing, storage or handling.

Enrichment has been used interchangeably with fortification, but elsewhere it has been defined as the restoration of vitamins and minerals lost during processing. The concentrations of phenolics and other phytochemicals present in the peels, pulp/pomace and seeds of many fruits and vegetables namely citrus, apples, peaches, pears, banana, pomegranate, berries, mangoes, onions, potatoes, tomatoes and sugar beet are generally substantially higher than in their respective edible tissues, suggesting these wastes and residues to be the potential sources for isolating bioactive compounds. The antioxidants (polyphenolic and other phytochemicals) and other bioactive compounds from these sources exhibit anti-cancer, anti-microbial (pathogens), antioxidative and immune-modulatory effects. In addition, they reduce incidence of cardiovascular diseases and capillary fragility, inhibit platelet aggregation and prevent thrombosis, oxidative stress, osteoporosis and diabetes in vertebrates. Specifically, the phenolics and flavonoids present in apple, date pit, rambutan (Nephelium lappaceum) peel, tomato peel extracts strongly inhibit tumour-cell proliferation. Penta-O-galloylglucoside (PGG) present in mango seed kernel extract and mango peel is used in pharmaceutical industries, as it possesses anti-tumor, antioxidant, ant cardiovascular and hepato-protective effects. The terpenoid and flavonoids in banana foliage exhibit anthelmintic properties. Pomace of apple, pear, orange, peach, blackcurrant, cherry, artichoke, asparagus, onion, raspberry, tomato and carrot, durian seeds (gelling and thickening agents), mango peels, date pits, cauliflower trimmings, empty

Pea pods and okara are used as dietary fibre supplements and as a functional ingredient in processed food products due to the presence of pectins and carotenoids and bound antioxidants. Some of the fruit and vegetable wastes are excellent source of bio pigments; examples being betalains in beet root pulp and carotenoid in carrot pulp. Tomato seeds, banana peel, rambutan and mango seed kernel, passion fruit seed, black currant, date pits are good sources of edible oil rich in polyunsaturated fatty acids. Many fruit and vegetable wastes are used as a substrate for the production of organic acids (citric, lactic and ferulic acids), single cell protein, essential oils, exogenous enzymes, bio-ethanol/methanol, bio-pesticides, bio-sorbants, biodegradable plastic, biofertilizers, bio-preservatives and edible mushrooms. Some have potential to decrease the emission of enteric methane.

Additives are used in foods for five main reasons:

- To maintain product consistency. Emulsifiers give to products a consistent texture and prevent them from separating. Stabilizers and thickeners give smooth uniform texture. Anticaking agents help substances such as salt to flow freely.
- To improve or maintain nutritional value. Vitamins and minerals are added to many common foods such as milk, flour, cereal and margarine to make up for those likely to be lacking in a person's diet or lost in processing.
- To maintain palatability and wholesomeness. Preservatives retard product spoilage caused by mold, air, bacteria, fungi or yeast. Bacterial contamination can cause foodborne illness, including lifethreatening botulism. Antioxidants are preservatives that prevent fats and oils in baked goods and other foods from becoming rancid or developing an off-flavor. They also prevent cut fresh fruits such as apples from turning brown when exposed to air.
- To provide leavening or control acidity/alkalinity. Leavening agents that release acids when heated can react with baking soda to help cakes, biscuits and other baked goods to rise during baking. Other additives help modify the acidity and alkalinity of foods for proper flavor, taste and color.

- To enhance flavor or impart desired color. Many spices, natural and synthetic flavors enhance the taste of foods. Colors, likewise, enhance the appearance of certain foods to meet consumer expectations.

3.5 Following appropriate contamination, quality and sequencing procedures

3.5.1 Follow contamination quality and sequencing procedures

Quality assurance refers to a systematic process taken throughout manufacturing to prevent and detect product deficiencies and product safety hazards. The category of contamination usually consists of the unplanned and unsuitable presence in either gross or minute quantities of one active substance in the presence of another. It is often limited to the presence of one active ingredient in the presence of another bulk or formulated active material. Cross-contamination usually occurs when common equipment or systems are used for the manufacturing and handling of different active substances. Improper cleaning procedures may contribute to this effect. Often the absence of contaminants or cross-contaminants is assured by either testing, proof of process compliance or conformance to strict good Manufacturing practices and is indicated to the customer via the certificate of analysis or through a continuing guarantee. Care must be maintained in all production operations to minimize and/or eliminate the risks of contamination and cross contamination. Adherence to directives regarding Good Manufacturing Practices and Proof of Performance for Existing Processes provides a high degree of certainty that production processes will meet this requirement. During industrial processing of fruits, large quantities of wastes are generated. This has become a serious problem as they exert an influence on environment and need to be managed and/or utilized. Further exploitation of the fruit processing by-products as sources of functional ingredients and possible applications has become a promising field and global requirement due to the increase in the concern towards the environment.

Natural functional compounds from fruit processing wastes can be used to replace synthetic additives adding multifunctional concepts by combining health benefits to technological use. Novel scientific and alternative technologies should be used to extract the optimum levels of bioactive compounds as well as other compounds of economic importance from the fruit wastes. A quality assurance system is specific to a manufacturer's operations and addresses product safety matters. The following elements of a quality system are selected for special emphasis due to their significant effect on product integrity and safety:

- Inspection and Testing

- Statistical Methods and non-Conforming Material

3.6 Taking stock feed samples to procedures.

3.6.1. Take stock feed samples

Ingredient quality is the foundation on which an animal ration is built. Correct sampling and sample evaluation enables the processor to make inferences about the quality of incoming grain, protein sources, micro-nutrients, and finished feed. Stock feed includes feed commercially produced and branded by enterprises as well as customer provided formulations. Animal-source foods are good sources of the micronutrients that are often lacking in staple foods such as cereals and tubers. Meats are excellent sources of iron, zinc, and several B vitamins including vitamin B-12. Milk is rich in vitamin B-12, vitamin A, riboflavin, and folate but is very low in iron. Indeed, animal products are the only natural source of vitamin B-12. Low intakes of animal-source foods explain the high prevalence of vitamin B-12 deficiency in many developing countries.

- The common stock feed include:
- Pellets
- Liquids
- Mashes
- Blocks
- Sampling Systems

Common sampling schemes used in the stock feed and grain industry include simple random sampling, stratified random sampling, and systematic sampling.

A simple random sampling from a population of N sampling units gives equal probability to all units. A stratified random sample is obtained by separating the population elements into non-overlapping groups, called strata. Then, a simple random sample is collected from each stratum. This typically is how shiploads are sampled each hold represents a stratum and multiple samples are collected randomly within each hold.

Forage samples should contain several pounds of material.

The sampling scheme, procedure, and sample preparation will vary depending on whether the material is dry forage, silage, pasture, green chopped forage, or forage in the field.

- Collect dry forage from at least 20 different locations using a core sampler. If a core sampler is not available, hand (grab) sampling can be used. Try to avoid leaf loss when using this procedure.
- Collecting silage samples from trench silos should be performed by removing a column 6 inches deep by 12 inches wide on the open face. Mix the silage and place a number of random handfuls in a plastic bag. Pack the sample tightly and seal the bag to exclude air.

3.7 Conducting Work with workplace environmental guidelines

3.7.1. Add micronutrient to product

Food fortification has been defined as the addition of one or more essential nutrients to a food, whether it is normally contained in the food, for the purpose of preventing or correcting a demonstrated deficiency of one or more nutrients in the population or specific population groups. Other terminology exists for the addition of nutrients to foods. Restoration means the addition to a food of essential nutrients, which are lost during the course of Good Manufacturing Process (GMP), or during normal storage and handling procedures, in amounts, which will result in the presence in the food of the levels of the nutrients present in the edible portion of the food before processing, storage or handling. Enrichment has been used interchangeably with fortification, but elsewhere it has been defined as the restoration of vitamins and minerals lost during processing.
Principles for Using Food Additives:

- The food additives being used should present no risk to the health of the consumer at the levels of use.
- The use of food additives is justified only when such use has an advantage, does not present a hazard to health of and does not deceive the consumer, as well as serves one or more of the following technological functions and needs, and only where these objectives cannot be achieved by other means which are economically and technologically practicable –

a. To preserve the nutritional quality of the food;

b. To provide necessary constituents for foods manufactured for groups of consumers having special dietary needs;

c. To enhance the keeping quality or stability of a food or to improve its organoleptic properties;

d. To provide aids in the processing, packaging, transport or storage of food, provided that the additive is not used to disguise the effects of the use of faulty raw materials or of undesirable (including unhygienic) practices of techniques during the course of any of these activities.

- All food additives shall be used under conditions of good manufacturing practice (GMP) which include the following:

a. The quantity of the additive added to food shall be limited to the lowest possible level necessary to accomplish its desired effect;

b. The quantity of the additive that becomes a component of food as a result of its use in the manufacturing, processing or packaging of a food and which is not intended to accomplish any physical, or other technical effect in the food itself, is reduced to the extent reasonably possible; and

c. The additive is prepared and handled in the same way as a food ingredient.

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 answer among the given alternative

1. Which micronutrient or additive is often added to fruit juices as a source of vitamin C?
   a) Citric acid
   b) Sodium benzoate
   c) Ascorbic acid
   d) Monosodium glutamate
2. Which micronutrient is commonly found in oranges and helps support a healthy immune system?
   a) Vitamin C
   b) Iron
   c) Calcium
   d) Fiber

3. Which additive is often used to preserve the color and texture of canned peas?
   a) Citric acid
   b) Sodium benzoate
   c) Ascorbic acid
   d) Calcium chloride

4. Which micronutrient is commonly found in spinach and contributes to healthy vision?
   a) Vitamin A
   b) Potassium
   c) Vitamin E
   d) Zinc

5. Which additive is frequently used to prevent browning in sliced apples?
   a) Citric acid
   b) Sodium metabisulfite
   c) Calcium carbonate
   d) Monosodium glutamate

6. Which micronutrient is often found in bananas and helps regulate blood pressure?
   a) Potassium
   b) Vitamin C

c) Iron
d) Vitamin K

Test II: Write true if the statement is correct and false if the statement is incorrect

1. Oranges are a good source of vitamin C, which helps support a healthy immune system.
2. Additives are commonly used in canned peas to preserve their color and texture.
3. Spinach is a good source of vitamin A, which contributes to healthy vision.
4. Citric acid is frequently used as an additive to prevent browning in sliced apples.
5. Bananas are a good source of potassium, which helps regulate blood pressure.

Test III: Write short answer for the following question.

1. When is the appropriate stage in the production process to add vitamin C fortification to fruits and vegetables?
2. Where beta-carotene should be incorporated during food fortification for fruits and vegetables?
3. At what point should potassium fortification be introduced in the processing of fruits and vegetables?
4. What is the recommended stage for adding folate fortification to fruits and vegetables?
5. When should calcium fortification be incorporated into the production process of fruits and vegetables?
6. Where in the manufacturing process is the ideal location to add iron fortification for fruits and vegetables?
7. At what stage should vitamin K fortification be included in food fortification for fruits and vegetables?
8. When is the appropriate time to introduce fiber fortification during the processing of fruits and vegetables?
9. Where should antioxidants, such as vitamin E, be added in the food fortification process for fruits and vegetables?
10. At what point should probiotics or prebiotics be incorporated into the production process of fruit and vegetable products?

Operation Sheet 3

3.1 Procedure for adding a micronutrient or additive to a product

Objective:

In general, the objective of adding a micronutrient or additive to a product is to enhance or improve certain aspects of the product's quality, nutritional value, stability, flavor, texture, appearance, or functionality

A. Equipment and tools:

- Weighing scale or balance
- Mixing equipment
- Sprayers or Atomizers
- Coating Equipment
- Encapsulation Equipment
- Solvent or Carrier
- Personal Protective Equipment (PPE)
- pH meters, temperature probes, moisture analyzers, or sensory evaluation tools.
- Storage Containers

B. Procedure:

- Identify the need and objective
- Select the micronutrient or additive
- Determine the optimal dosage
- Prepare the micronutrient or additive
- Incorporate the micronutrient or additive
- Monitor and control the process

- Perform validation and verification activities
- Maintain accurate records of the micronutrient or additive addition process, including details

LAP TEST-3	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: Preform adding a micronutrient or additive to a product

LG#31	LO4. Record use of micronutrient or additive

Instruction sheet

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

- Recording Type and amount of micronutrient or additive to enterprise and statutory requirements if applicable.
- Generating and adding Target species correct labels to products

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:

- Record Type and amount of micronutrient or additive to enterprise and statutory requirements if applicable.
- Generate and add Target species correct labels to products

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 4

4.1Recording type and amount of micronutrient or additive used

4.1.1. Uses of additive

The use of food additives originated in ancient times. Far back in time people understood that some foods contained natural chemical compounds that could be used in food storage, although the structure and mechanisms of action of the sub- stances were unknown. For example, the naturally occurring chemical substance benzoic acid is present in several berries and fruits, such as lingon berries, and acts as a preservative and protects against yeast, bacteria and fungi. Additives perform a variety of useful functions in foods that are often taken for granted. Since most people no longer live on farms, additives help keep food wholesome and appealing while en route to markets sometimes thousands of miles away from where it is grown or manufactured.

Additives also improve the nutritional value of certain foods and can make them more appealing by improving their taste, texture, consistency or color. Some additives could be eliminated if we were willing to grow our own food, harvest and grind it, spend many hours cooking and canning, or accept increased risks of food spoilage. But most people today have come to rely on the many technological, aesthetic and convenience benefits that additives provide in food." Food manufacturers attempt to increase the shelf life of their products by controlling and preventing deterioration; therefore, additives may be used to preserve or combat microbial or enzymatic deterioration. All living tissue resists microorganism attack to some degree, and additives assist in microbial (pathogens and nonpathogens) protection.

The use of additives at the point of manufacture or processing cannot stop all foodborne illness though and cannot guarantee food safety for the population at large. For example, mishandling of food at restaurants and homes contributes a larger portion of foodborne illness than handling at food processing plants. A second use of food additives is that they may be included in food to maintain or improve nutritional value. They enrich, fortify, or restore what is lost in processing. Additives may add nutrients and correct deficiencies, such as when iodine was used to treat goiter

or when the minerals calcium and iron are added to food. Antioxidants such as lemon juice, vitamins A and C are added to control the damaging effect of exposure to oxygen, or vitamin D is added to fortify milk.

Many grain products are enriched or fortified with thiamin to prevent the disease beriberi, niacin to control the devastating pellagra, and more recently, with folate to prevent the reoccurrence of neural tube defect.

Nutritional fortification is of tremendous benefit to many people.

One of the above additives, in fact the very first food additive in the United States, was iodine. Its function was nutritional: to treat and prevent goiter, common in the Great Lakes and Pacific Northwest regions of the United States. It is shown then that additives play a role in food protection and nutrition fortification. Other roles of additives are as flavor and color sensory agents. These agents may be added to food so that it is made more appealing. As well, additives may be included in processing, for example, to maintain product consistency, to emulsify, stabilize, or thicken a food.

Table 4.1 Types of additives and their function

No	Type of Additives	Uses/Function
1	Sweeteners	Increase the sweetness (can be added or table-top)
2	Colors	Add or restore color
3	Preservatives	Prolong shelf-life by inhibiting microbial deterioration or the growth of pathogens
4	Antioxidants	Prolong shelf-life by inhibiting oxidative deterioration (e.g., color changes or rancidity)
5	Acids	Increase the acidity and/or impart a sour taste
6	Acidity	regulators Alter/control the pH of a foodstuff
7	Anti-caking agents	Reduce particle agglomeration
8	Anti-foaming agents	Prevent/reduce foam formation

9	Bulking agents	Increase the volume of a foodstuff without significantly increasing its energetic value
10	Emulsifiers	Ease the formation/maintenance of an homogenous mixture of two immiscible phases
11	Emulsifying salts	Convert cheese proteins into a dispersed form contributing to an homogenous distribution of other components (e.g., fat)
12	Firming agents	Either keep fruit and vegetables firm/crisp or produce/strengthen gels
13	Flavor enhancers	Enhance taste/odor
14	Foaming agents	Ease the dispersion of a gaseous phase in a liquid/solid
15	Gelling agents	Form a gel and improve texture
16	Stabilizers	Maintain the physico-chemical state of a foodstuff
17	Raising agents	Release gas therefore increasing the volume or a dough or batter
18	Sequestrants	Complex metallic ions
19	Thickeners	Increase the viscosity
20	Flour treatment agents	Improve the baking quality of flours/dough's (non-emulsifiers



Figure 3.1: Food additive

4.2 Generating and adding Target species correct labels to products

4.2.1. Add target species to product

Food additives are substances added to food to preserve flavor or enhance its taste, appearance, or other qualities. Some additives have been used for centuries; for example, preserving food by pickling (with vinegar), salting, as with bacon, preserving sweets or using sulfur dioxide as with wines. With the advent of processed foods in the second half of the twentieth century, many more additives have been introduced, of both natural and artificial origin. Food additives also include substances that may be introduced to food indirectly (called "indirect additives") in the manufacturing process, through packaging, or during storage or transport.



Figure 3.2: Food additive

The term micronutrients are used to describe vitamins and minerals in general. Macronutrients, on the other hand, include proteins, fats and carbohydrates. Vitamins are organic compounds made by plants and animals, which can be broken down by heat, acid or air. On the other hand, minerals are inorganic, exist in soil or water and cannot be broken down. The micronutrient content of each food is different, so it is best to eat a variety of foods to get enough vitamins and minerals. An adequate intake of all micronutrients is necessary for optimal health, as each vitamin and mineral has a specific role in your body. Vitamins and minerals are vital for growth, immune function, brain development and many other important functions. Depending on their function, certain

micronutrients also play a role in preventing and fighting disease. Generally, target species may include:

- Land and marine animals raised commercially for meat,
- Skin products and
- Milk

Table 4.2.1 Function of Micronutrients

No	Micronutrients	Function
1	Vitamin A	Necessary for proper vision and organ function
2	Vitamin D	Promotes proper immune function and assists in calcium absorption and bone growth
3	Vitamin E	Assists immune function and acts as an antioxidant that protects cells from damage.
4	Vitamin K	Required for blood clotting and proper bone development
5	Vitamin B1 (thiamine)	Helps convert nutrients into energy.
6	Vitamin B2 (riboflavin)	Necessary for energy production, cell function and fat metabolism.
7	Vitamin B3 (niacin)	Drives the production of energy from food.
8	Vitamin B5 (pantothenic	Necessary for fatty acid synthesis acid
9	Vitamin B6 (pyridoxine)	Helps your body release sugar from stored carbohydrates for energy and create red blood cells.
10	Vitamin B7 (biotin)	Plays a role in the metabolism of fatty acids, amino acids and glucose.
11	Vitamin B9 (folate)	Important for proper cell division.
12	Vitamin B12(cobalamin)	Necessary for red blood cell formation and proper nervous system and brain function.
13	Vitamin C (ascorbic acid)	Required for the creation of neurotransmitters and collagen, the main protein in your skin

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 answer

1. Additives are commonly used in fruits and vegetables to:
   a) Enhance color and appearance
   b) Extend shelf life
   c) Improve texture and firmness
   d) All of the above
2. Which of the following is a typical use of additives in fruit and vegetable processing?
   a) Prevent enzymatic browning
   b) Maintain nutritional integrity
   c) Enhance flavor and aroma
   d) All of the above

2. Additives can be used in canned fruits and vegetables for:
   a) Preservation
   b) Texture modification
   c) Acidification
   d) All of the above

3. Which of the following is a common use of additives in fruit and vegetable juices?
   a) pH adjustment
   b) Antioxidant preservation
   c) Flavor enhancement
   d) All of the above
4. Additives in frozen fruits and vegetables can help to:
   a) Preserve color and texture

b) Retain nutritional value

c) Prevent freezer burn

d) All of the above

5. Additives are commonly used in fruit and vegetable products to:

a) Enhance food safety

b) Improve consistency and stability

c) Control pH levels

d) All of the above

6. Which of the following is a typical use of additives in fruit and vegetable jams or preserves?

a) Providing gelling properties

b) Enhancing flavor and aroma

c) Extending shelf life

d) All of the above

7. Additives can be used in dried fruits and vegetables for:

a) Preventing oxidation and discoloration

b) Maintaining texture and quality

c) Enhancing rehydration properties

d) All of the above

8. Which of the following is a common use of additives in fruit and vegetable sauces or dressings?

a) Emulsification and stabilization

b) Acidification for preservation

c) Enhancing viscosity and mouthfeel

d) All of the above

9. Additives in fruit and vegetable snacks can serve to:

a) Improve crispiness and crunch

b) Enhance flavor and seasoning

c) Extend shelf life and prevent spoilage

d) All of the above

Test II: Write true if the statement is correct and false if the statement is incorrect

1. Processed fruit and vegetable products often require additives for preservation or flavor enhancement.
2. Additives used in processed fruit and vegetable products should be clearly listed on the product label.
3. All additives used in processed fruit and vegetable products are safe for human consumption.
4. The presence of allergens, such as nuts or gluten, should be indicated on the labels of processed fruit and vegetable products.
5. Processed fruit and vegetable products labeled as "organic" are always free from synthetic additives.
6. The nutritional information, including calories, fat content, and vitamins, should be listed on the labels of processed fruit and vegetable products.
7. The country of origin of the processed fruit and vegetable products is relevant information to include on the label.
8. Processed fruit and vegetable products labeled as "low sugar" always contain artificial sweeteners.
9. The presence of genetically modified ingredients should be indicated on the labels of processed fruit and vegetable products.
10. The additives used in processed fruit and vegetable products are the same for all target species, including humans and animals.

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2. Agricultural Marketing Resource Center (AgMRC) - https://www.agmrc.org/
3. Cornell University Extension (https://cce.cornell.edu/) and University of California Agriculture and Natural Resources (https://ucanr.edu/).
4. Food Innovation Center - Center for Food and Agricultural Business, Purdue University - https://ag.purdue.edu/foodinnovation/

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