# Spice and HerbsProcessing Level-II

Based on May 2019, Version 2 Occupational standards

## Module Title: - Operating a Sorting and Grading Process

LG Code: IND SHP2 M14 LO (1-3) LG (50-52)

TTLM Code: IND SHP2 TTLM 1020v1

October 2020

United Nations Educational, Scientific and Cultural Organization

# Table of Contents

| LG #50 | LO #1- Prepare the sorting and grading equipment and process for operation |
|---|---|

**Instruction sheet**

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

- Confirming availability of materials to meet sorting and grading operating
- Identifying and confirming cleaning and maintenance requirements
- Fitting and adjusting machine components and related attachments to meet sorting and grading
- Enter processing and operating parameters to meet safety and production
- Checking and adjusting equipment performance
- Carrying out pre-start and service checks workplace 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:

- Confirm availability of materials to meet sorting and grading operating
- Identify and confirm cleaning and maintenance requirements
- Fit and adjust machine components and related attachments to meet sorting and grading
- Enter processing and operating parameters to meet safety and production
- Check and adjust equipment performance
- Carryout pre-start and service checks workplace 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”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

## Information Sheet 1- Confirming availability of materials to meet sorting and grading operating

### 1.1. Introduction

Sorting and grading: raw materials can be sorted and graded based on many different parameters determined by the type of produce, whether for further processing, immediate sale or storage and the target market / client requirements.

- **For processing**, grade requirements will depend on the type of produce and the intended use of the produce. Freedom from soil and from pests and diseases will be important. In Ethiopia grading is usually done by hand based on visual inspection and selection/ rejection. Rulers and grading rings may be used to confirm size and pictures are useful for explaining color, disease, trueness to type and stage of maturity to workers. In more industrialized countries grading may be done mechanically. Mechanical grading is more reliable but requires specialist machinery and maintenance so is only cost effective on a large scale.
- **For the local market,** in Ethiopia most customers are mainly concerned about price but good appearance, size and freedom from rotting, signs of aging and physical damage will also be considered.
- **For contract sales**, the requirements and standards for grading will be described in detail in the contract. Requirements are often higher than the legal minimum standard and typically include:
  - ✓ Removal of all produce that is physically damaged or infected with pests and diseases
  - ✓ Removal of produce that is not true to type (misshapen, wrong color, etc.)
  - ✓ Removal of produce that is dirty
  - ✓ Inclusion only of produce of the stated acceptable size and stage of maturity.
  - ✓ Size may be expresses as length and or diameter
  - ✓ Stage of maturity may be expresses as stage of bud opening, color, sugar content, presence of seed development, etc.
- **For export**, produce needs as a minimum to conform to the grading standards of the receiving country.

- **For storage,** removal of all produce that is physically damaged or infected with pests and diseases is critical to reduce the risks of pathogen related deterioration during storage. Small produce and produce with a low sale value may also be removed and sold immediately to make the storage operation more cost effective.

Table: 1.1. Spice and herbs type and their part use as raw materials for sorting and grading

| **Plant organs use as raw material** | **Spice and herbs** |
|---|---|
| Aril | Mace of nutmeg |
| Barks | Cassia, cinnamon |
| Berries | All spice, black pepper, chilies |
| Buds | Clove |
| Bulbs | Onion, garlic, leek |
| Pistil | (female part of flower) Saffron |
| Kernel | Nutmeg |
| Leaf | Basil, bay leaf, mint, marjoram, sage, curry leaf |
| Rhizome | Ginger, turmeric |
| Latex from rhizome | Asafoetida |
| Roots | Angelica, horse-radish |
| Seeds | Ajowan, aniseed, caraway, celery, coriander, dill, fennel, fenugreek mustard, poppy seed |

Figure: 1.1. Different spice and herbs of raw materials

## 1.2. Spice and herbs raw materials for sorting and grading

### 1.2.1. Leaves and stems

The aromatic herbs such as basil, bay leaves, mints, oregano, parsley, rosemary, sage, tarragon and thyme are often used fresh to garnish food, as dry seasonings or for extracted essential oils. The aroma, a function of their essential oil composition, is dependent on chemo type and specific chemo types can be chosen for an end-use. The essential oil composition and yield will also change during the seasons, and crop harvest should be directed to maximize both the essential oil content and quality parameters. As a general rule, the leaf and stem should be cut when the growth has matured to an elongated flower stem but without full flower or significant senescence of the lower leaves. The essential oil can be distilled from fresh or dry plant material. Harvesting the plant material should be avoided when it is wet and if it is to be dried the plant material should be evenly spread onto the drying racks or drier to ensure there is no sweating, fermentation and microbial invasion.

Figure: 1.2. Herbs raw materials

### 1.2.2. Flowers, buds and seed

When flowers and buds are the source of a spice or essential oil, the harvest time can be throughout the year in the tropics or during a limited flowering season in temperate regions. As an example in the tropics, clove clusters do not ripen evenly and each tree is harvested five to eight times in the fruiting season. Clove clusters are picked when the unopened flower buds are full-sized, the calyx base has developed the characteristic pink flush, but no buds have opened or petals fallen to expose the stamens.

The harvested clove clusters are taken to the storage center and the stems, which are about 25% of the total dry weight, are removed and separated. Cloves are harvested by hand but modern orchards will have tractor-mounted platform pickers. Similarly the ylang-ylang tree flowers throughout the year. The flowers, a source of essential oil, are gathered principally after the rainy season and during the dry season. At this time the flowers are drier, contain more oil and the oil is of higher quality. Flowers are harvested early in the day. Only fully developed yellow flowers are picked as green flowers produce poor quality oil. In order to avoid fermentation, the flowers should not be held in a mass and distillation should be undertaken as soon as possible.

In temperate environments flowering is seasonal and the stigma from the autumn flowering saffron crocus is an example of a flower-derived spice which has a specific harvesting time, is the spice used to color and flavor food. There can be up to 12 flowers

per corm which should be hand-picked daily, after the flower has opened but has not withered. The stigma is hand-separated or airflow-separated from the flower parts at the drying and processing facility.

Figure: 1.3. Bud of Clove

### 1.2.3. Roots and rhizomes

The common spices which are derived from roots, bulbs and rhizomes are turmeric, ginger, onion, garlic, horseradish and wasabi. Turmeric**,** a perennial herb grown as an annual crop**,** is ready for digging when the lower leaves turning yellow. The length of time to harvest maturity is dependent on cultivar. Hand digging is the most common form of harvesting the rhizomes although diggers and lifters can be used. The leaves must be cut prior to mechanical lifting or after hand digging. Care is necessary to avoid damage to the rhizome (splitting or bruising) as injuries can result in fungal infection and rejection. Rhizomes are lifted whole, washed, sun dried and the rhizome fingers (which are kept as seed material) are separated from the mother rhizome. The harvesting of ginger**,** a perennial herb but often grown as an annual, depends on the cultivar and varies from 7-9 months for annual crops while perennial crops are harvested at the growers' discretion. The time to harvest is also dependent on the projected end-use with fresh ginger with low fiber content harvested at about 190 days after planting. The harvesting method must ensure there is no rhizome damage and both manual and mechanical methods of rhizome digging are used. Some production areas use both methods by mechanically loosening the rhizomes to assist the hand lifting. Following lifting the rhizomes are

washed, the roots removed and then killed by immersion in boiling water for about 10 minutes, dried and then stored.

Figure: 1.4. Rhizome of turmeric

### 1.2.4. Bark and wood

Many plants which are harvested for wood or bark products are managed under coppice plantation systems. Cinnamon and cassia production is an example of such a practice. Harvesting of the shoots is undertaken during the rainy season two years after coppicing. The selected shoots must have a uniform brown color of bark and have at least two years growth. The rough outer bark of the selected shoots is first scraped off and the young tender inner bark is peeled off carefully from the stem. The inner bark curls naturally into the well-known quills. The best pieces of the peeled bark are packed with small pieces and tightly rolled to preserve the flavor and dried. The coppiced shoots are left for fermentation for 24 hours, dried in the shade for one day and in the sun for four days. The smaller quills are inserted into larger ones to form compound quills. The products are graded as quills, quilling's, featherings, scraped chips and powders. The finest quality bark is obtained from shoots (<1.25 m by 1.25 cm diameter) with uniform brown thin bark harvested at six-month intervals.

Figure: 1.5. Bark and wood of cinnamon

| Self-check 1 | Written test |
|---|---|

Name…… ID…… Date…….

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

**Test I: Short Answer Questions**

1. List the spices which their bark and wood use for processing?(2pts)

2. List the spices which their seed, bud and bulb use for processing?(2pts)

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

1. Grade requirements will depend on the type of produce and the intended use of the produce. (2pts)

2. While conducting grading, removal of all produce that is physically damaged or infected with pests and disease. (2pts)

***Note:*** **Satisfactory rating - 8 points** **Unsatisfactory - below 8 points**

Score = ----------

Rating: ----------

You can ask you teacher for the copy of the correct answers.

**Answer sheet**

**Test I**

1._____

2._____

**Test II**

1._____

2._____

**Information Sheet 2- Identifying and confirming cleaning and maintenance requirements**

## 2.1. Cleaning raw materials

Root and rhizome spices such as angelica, ginger and turmeric, which are dug out of the soil, need washing to remove the adhering mud and dirt. Pressure- water washing may be possible, wherever facilities are available. Reduction in the microbial load will also be influenced by the efficacy of this operation.

- Not accept or use raw materials which contain or carry parasites, hazardous micro-organisms or toxic substances that will not be reduced to an acceptable level by normal plant procedures of sorting or preparing.
- Prepare product from raw materials that are unpolluted, sound, in normal condition and in accordance with these standards.
- Raw materials should, where appropriate, be inspected and sorted prior to processing. Where necessary laboratory tests shall be performed to establish fitness for use. Only sound, suitable raw materials should be used.
- Protected against contamination by pests, physical, chemical or microbiological hazards and other objectionable substances.
- Protected from detrimental changes to temperature and or other physical parameters that may be caused by crushing, abrasion and vibration.
- Not processed or used unless inspected for contamination, spoilage and moulds before processing and found to be in compliance with the accepted criteria in this Standard.
- Raw unprocessed/or unlearned foods shall be fully separated either physically or by time from the finished or ready to eat foods with effective intermediate cleaning and where appropriate disinfection.

## 2.2. Hand tools use for sorting and grading

Baskets, bags, hand cart, cleaning brush, sieve and buckets use for sorting and grading spice and herbs. Buckets are better in protecting produce, since they do not collapse and squeeze produce. Plastic buckets crates are relatively expensive but are durable, reusable and easy to clean. When empty, they can be nested to save space in storage

or transport. When filled they can be stacked if every other crate is turned in the direction opposite to the one below.

Figure: 1.1. Cleaning tools

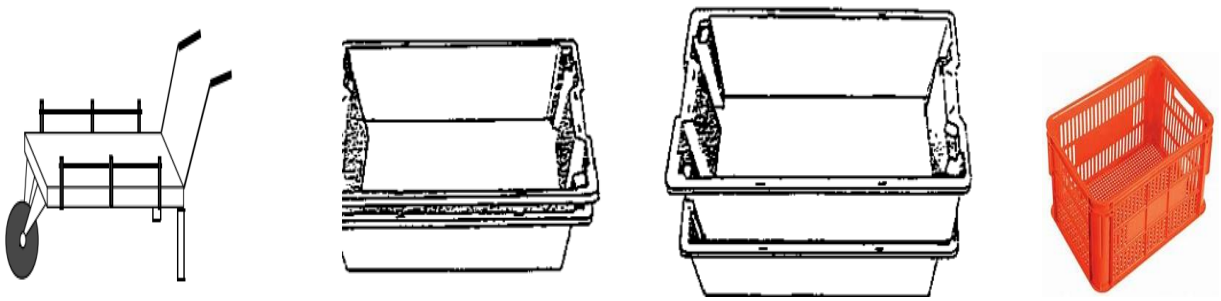


Figure: 1.2. Hand tools use for sorting and grading (hand cart and plastic box)

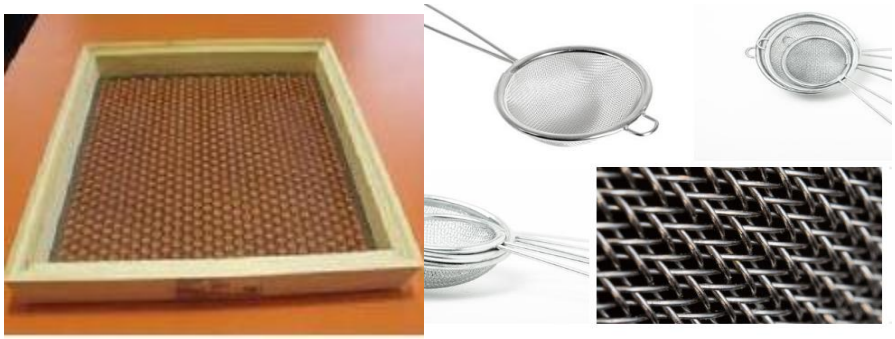


Figure: 1.3. Different sieve sorting and grading

When sorting for rejects, and removing any product that is too small, decayed or damaged, the height of the sorting table should be set at a level comfortable for sorters.

Locations of the table and the sorting bins should be chosen to minimize hand movements. It is recommended that the workers' arms create a 45 degree angle when she/he reaches toward the table, and that the width of the table be less than 0.5 meter to reduce stretching. Good lighting (500 to 1000 lux at work surface) will enhance the ability of the sorter to spot defects, and dark, dull belts or table tops can reduce eye strain. If a conveyor system is in use, the product must not flow too fast for the sorters to do their work. The rotational speed of push-bar or roller conveyors should be adjusted to rotate the product twice within the immediate field of view of the worker. Periodical rotation of worker positions on the line will help to reduce monotony and fatigue. Supervisors should be able to quickly identify under-sorting and over-sorting.

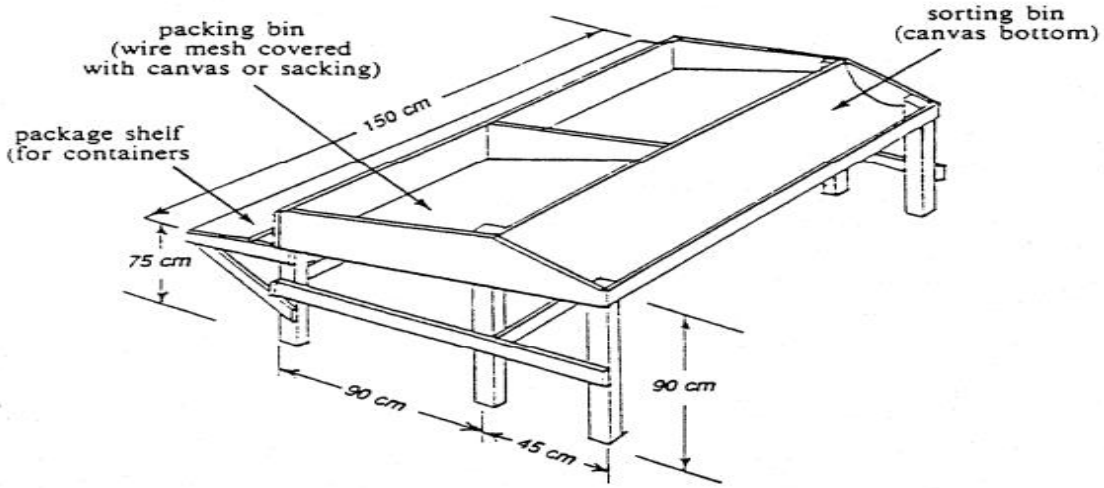
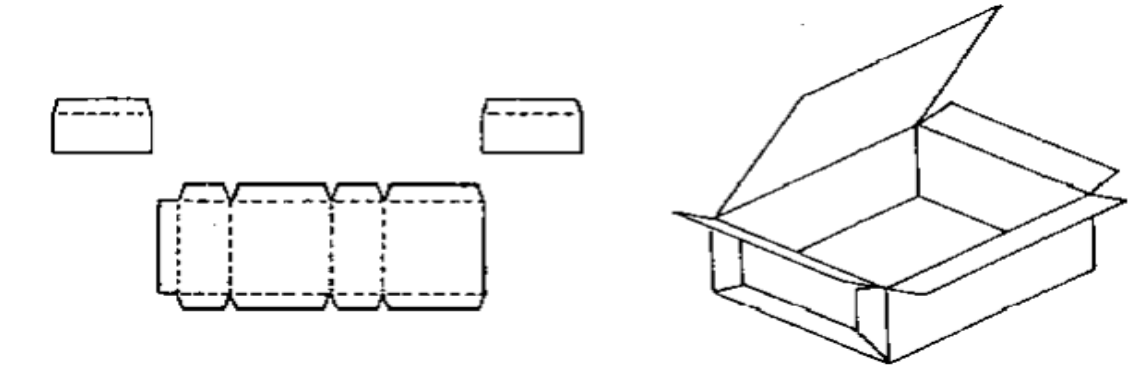



Figure:1.4. Table for sorting and grading of spice

The diagrams below are for a variety of commonly used fiberboard containers. Final dimensions can be altered to suit the needs of the handler, and all containers should have adequate vents. Bliss-style box:

**Bliss-style box:**



**Full telescoping box:**

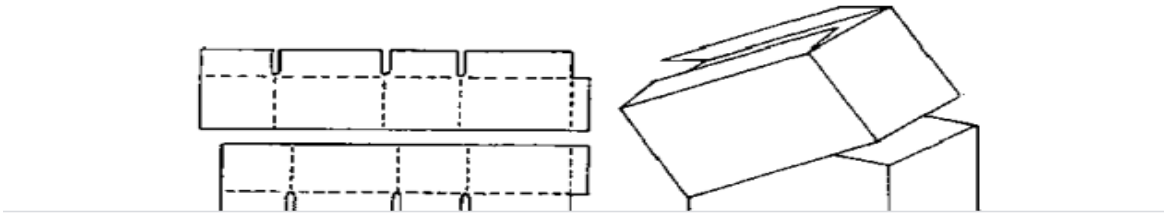


Figure:1.5. Table for sorting and grading of spice

## 2.3. Equipment and machine use to sort and grade spice and herbs

Spice and herbs grading is a committed agro industry offering best solutions in the sorting and grading processes by offering a qualitative range of products which help in improving the produce in quality and value. With a positive outlook and scientific approach, we procure the best machineries which help the farmers in de-stoning, sieving, husking, sorting, grading and other agricultural operations. Color sorter, grain sorter, size sorter machine, grain separator, bulb separator, fruit separator, rotary grain separator, and other machine mostly use to sort and grade spice and herbs. Saffron corm grading machine consists of hopper & elevator, roller inspection conveyor, air blower and grading part. Simple installation and operation, it can accurately sort saffron corms into different grades according to the diameters required.

Figure: 1.5. Spice grader machine

Figure: 1.6. Garlic clove grader machine


Figure: 1.7. Spice sorter machine

## 2.4. Cleaning tools, equipment and machinery

Tools, equipment and machinery should be cleaned and sterilized according to the manufacturer's specifications, enterprise procedures and regulations. This is used to increases life span of tools and equipment and avoids scarcity of tools and equipment at critical periods. Always before storing of tools and equipment cleaning is a must. Plant sap and organic debris builds up on parts of tools and equipment that are in regular

contact with produce. This plant sap and organic debris will cause corrosion of metal parts, reducing the life of the tools, equipment and the sharpness of the cutting blades of different machineries. Unnecessary damage to produce occurs and the risk of injury to the operator increases when blunt tools are used. Produce may also be contaminated by the residues leaf on tools and equipment from previous use.

Equipment should be designed to facilitate cleaning and disinfection with little or no water and, when wet cleaning is required, to allow thorough drying before reusing the equipment for spices and dried aromatic herbs. Alternatively the design should allow disassembly such that parts can be taken to a room designed for wet cleaning and disinfection, when applicable. The equipment design should be as simple as possible, with a minimal number of parts and with all parts and assemblies easily accessible and/or removable for inspection and cleaning. Equipment should not have pits, cracks, corrosion, crevices, recesses, open seams, gaps, lap seams, protruding ledges, inside threads, bolt rivets, or dead ends. Hollow areas of equipment as well as cracks and crevices should be eliminated whenever possible or permanently sealed. Items such as bolts, studs, mounting plates and brackets should be continuously welded to the surface and not attached via drilled and tapped holes. Welds should be ground and polished smooth. Push buttons, valve handles, switches and touch screens should be designed to ensure product and other residues (including liquid) do not penetrate or accumulate in or on the enclosure or interface.

Equipment should be installed so as to allow access for cleaning and to minimize transfer of dust particles to other pieces of equipment or to the environment. The risk of contamination from equipment should be assessed and controlled. Wherever possible, forklifts, utensils, and maintenance tools for the finished product and packaging areas should be different from those used in the “raw” material area (e.g. prior to the microbial reduction treatment).

## 2.5. Maintenance of tools, equipment and machinery

Maintenance of all tools, equipment and machinery should be carried out in accordance with the manufacturer's recommendations.

When carrying out maintenance activities remember:

- Turn the machine OFF and DISCONNECT from the electricity before starting work
- Do not put your head and hands into moving machinery
- Replace the safety guards are cleaning
- Only work on tasks and machinery that you are authorized to work on
- Account for all tools, equipment and machinery parts on completion of the job.

| 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: Short Answer Questions**

1. List the importance of cleaning and maintaining of tools, equipment and machinery? (3pts)

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

1. Maintenance of all tools, equipment and machinery should be carried out in accordance with the manufacturer's recommendations. (2pts)

2. Plastic buckets crates are relatively expensive but are durable, reusable and easy to clean.(2pts)

***Note:*** **Satisfactory rating - 7 points** **Unsatisfactory - below 7 points**

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

**Answer sheet**

**Test I**

1._____

**Test II**

1._____

2._____

**Information Sheet 3- Fitting and adjusting machine components and related attachments to meet sorting and grading**

### 3.1. Methods of machine safeguarding

There are many ways to safeguard sorting and grading equipment or machines. The type of sorting and grading, the size or shape of stock, the method of sorting and grading, and the physical layout of the sorting and grading area, the type of material, and production requirements or limitations will help to determine the appropriate safeguarding method for the individual equipment or machine. As a general rule, power transmission apparatus is best protected by fixed guards that enclose the danger areas. For hazards at the point of operation, where moving parts actually perform work on stock, several kinds of safeguarding may be possible. One must always choose the most effective and practical means available.

### 3.2. Adjusting machine component

The openings of these barriers are determined by the movement of the stock. As the operator moves the stock into the danger area, the guard is pushed away, providing an opening which is only large enough to admit the stock. After the stock is removed, the guard returns to the rest position. This guard protects the operator by placing a barrier between the danger area and the operator. The guards may be constructed of plastic, metal, or other substantial material. Self-adjusting guards offer different degrees of protection. The point consider when fitting and adjusting machine component and related attachment

- Become familiar with the equipment or machine before the first operation. Read the manual that came with the machine
- Never leave the machine unattended while the engine is running. Keep children away from the machine. Keep hands and feet away from moving parts
- Do not fill the tank while the engine is running
- Keep all flammable materials (including dry straw) away from the engine
- Do not oil, grease, or adjust the machine during operation. Wait until all moving parts have stopped before servicing
- Do not wear loose fitting clothing that may be picked up by moving parts

- While operating, keep all shields and guards in place
- Never extend hands or feet into the feed opening of the machine
- Never operate your machine in a closed shed or garage. Exhaust fumes are dangerous to your health
- Do not operate machine with loose peg teeth, bolts and nuts. Loose peg teeth may be ejected at high speeds, causing injury to operators and damage to the thresher
- Keep a first-aid kit at hand
- Tie up long hair to prevent entangling
- Do not wear neckties or other garments that may be wrapped into moving parts of the machine.

### 3.3. Fittings machine component

Fitting are threaded or snap-lock attachments allowing connections between different machine components. Made of stainless steel, fittings have various pressure ratings that are usually higher than the components being connected. This allows for fail-safe operation at a possible weak point in the circuit. The only repair on a fitting is replacing any failed seals. Otherwise, a failed fitting must be replaced. As fittings are attached with swage pressure (connecting fittings with compression), the components attached to the fitting (hose or tube) are distorted. Replacing a fitting usually means also replacing the connected piece.

| 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: Short Answer Questions**

1. List the point consider when fitting and adjusting machine component and related attachment?(3pts)

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

1. Never extend hands or feet into the feed opening of the machine. (2pts)

2. Keep all flammable materials (including dry straw) away from the engine.(2pts)

**Note: Satisfactory rating - 7 points** **Unsatisfactory - below 7 points**

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

**Answer sheet**

**Test I**

1._____

**Test II**

1._____

2._____

## Information Sheet 4- Enter processing and operating parameters

### 4.1. Entering processing/operating

A spice and herbs sorting and grading technician must have the ability to plan, organize, prioritize, calculate and handle pressure. The individual must possess reading, writing and communication skills. In addition, the individual must have personal and professional hygiene.

During sorting and grading of spice and herbs, enterprise work procedures describe how to do the various sorting and grading/ tasks on spice and herb to be used is based on sorting and grading parameters(quality, size, color, present of defects, maturity status etc.. In some case these processers are handed down by 'word of mouth' but now in most large processing area the procedures are documented to ensure that all operators know what to do and that work is done using the correct procedures. Your supervisor or line manager will be able to provide advice and guidance about the procedures to use and your role will be organizing activities and ensuring that all the enterprise work procedures are followed correctly by yourself and your supervisor.

The requirements of the client and the target market will determine the standards to be used for various sorting and grading operations, e.g**.** quality of raw materials, produce accepted and type of processing to be used. For some markets these requirements may be defined in Law but for others buyer preference dictates the price and raw material producer respond to their requirements to secure good price. For contract sales, client requirements will be listed in the contract.

In a large processing area the owner of manager will meet with the buyers and the processer manager will be informed of the standards to be used for produce processing. These requirements will then be explained to all supervisors and quality assurance staff involved and this team will be responsible to explain to workers and ensure that the required standards are achieved.

| Self-Check – 4 | Written test |
|---|---|

Name……ID…… Date…….

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

**Short Answer Questions**

1. What guideline follow while performing various processing operations / tasks?(3)

*Note:* Satisfactory rating - 3 points Unsatisfactory - below 3 points

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

**Answer sheet**

1._____

_____

## Information Sheet 5- Checking and adjusting equipment performance

### 5.1. Checking tools, equipment and machinery

The purpose of checking of equipment and machinery is to identify whether work equipment can be operated, adjusted and maintained safely with any deterioration detected and remedied before it results in a health and safety risk. Not all work equipment needs formal check to ensure safety and, in many cases, a quick visual check before use will be sufficient. However, inspection and checking is necessary for any equipment where significant risks to health and safety may arise from incorrect installation, reinstallation, deterioration or any other circumstances. The need for inspection and inspection frequencies should be determined through risk assessment. The importance of checking a tools equipment and machinery;

- To perform sorting and grading operation without any interruption
- In order to separating functional & un functional tools & equipment
- Ready for repaired & maintenance
- Care for environmental condition
- Disposing or sale out of depreciated/ retied equipment
- For kaizen application
- To know loss equipment
- To separate well cleaned & un-cleaned tools
- To maintain personnel health and safety

### 5.2. Adjusting tools, equipment and machinery performance

Adjustments; various adjustments are required before starting machine operation. The machine is to be installed on clean level ground and is to be set according to task conditions. Any piece of equipment (including tools and furniture) identified as unsafe, either in normal day-to-day activities or during a safety inspection, must be promptly tagged using a tag out. Then further action must be taken for repair or disposal.

Equipment identified as faulty should be disconnected and tagged, and appropriate service people contacted to arrange repair or replacement to improve the performance.

Think, plan and check

- Lockout procedure must be employed whenever a piece of equipment is being repaired and there is the possibility of that equipment being switched on without the knowledge of the repairer.
- Identify all parts of any equipment or system that needs to be shut down.
- Find the switches, valves or other devices that need to be switched off.
- Follow the correct procedure for the shutdown of equipment so you don't endanger anyone.

| Self-Check – 5 | Written test |
|---|---|

Name…… ID……. Date…….

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

**Test I: Short Answer Questions**

1. The importance of checking a tools equipment and machinery? (3pts)

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

1. The purpose of checking of equipment and machinery is to identify whether work equipment can be operated, adjusted and maintained safely. (2pts)

2. Equipment identified as faulty should be disconnected and tagged, and appropriate service people contacted to arrange repair or replacement to improve the performance. (2pts)

***Note:*** **Satisfactory rating - 7 points** **Unsatisfactory - below 7 points**

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

**Answer sheet**

**Test I**

1._____

**Test II**

1._____

2._____

**Information Sheet 6- Carryout pre-start and service checks workplace requirements**

## 6.1. Pre-start checks of equipment and machine

A responsible operator, running a pre-start check on your plant or machinery before you start the day is the best way to ensure the job gets done safely and without delay. Undertaking a pre-start check on your machine before you start a day work happens in three stages.

- Visual inspections of important features prior to starting the machine
- Visual & function tests while the machine is turned on but stationary
- Testing the machine's functions during a short drive

Check all the tools and equipment before use.

- Are all the tools and equipment functional and sufficient enough in number?
- Are all free from any contaminants?
- Is there any tools and equipment which needs maintenance?
- Is the tools and equipment function coincides with the given task?
- Then check and report to your supervisor the condition of these tools and equipment.
- After reporting the condition of tools and equipment, your supervisor will guide you what to do if there is insufficient of tools and equipment to perform this particular work.

## 6.2. Service checking of tools, equipment and machinery

Tools, equipment and machinery shall be kept in proper operating condition and used only for the purpose for which they were designed. If proper and safe tools are unavailable, this should be reported to the supervisor. All tools, equipment and machineries should be inspected at regular intervals, and any tool that develops defects while in use shall be taken from service, tagged and not used again until restored to proper working condition.

**. Pre-start checks of equipment and machine**

A responsible operator, running a pre-start check on your plant or machinery before you start the day is the best way to ensure the job gets done safely and without delay.

Undertaking a pre-start check on your machine before you start a day work happens in three stages.

- Visual inspections of important features prior to starting the machine
- Visual & function tests while the machine is turned on but stationary
- Testing the machine's functions during a short drive

Check all the tools and equipment before use.

- Are all the tools and equipment functional and sufficient enough in number?
- Are all free from any contaminants?
- Is there any tools and equipment which needs maintenance?
- Is the tools and equipment function coincides with the given task?
- Then check and report to your supervisor the condition of these tools and equipment.
- After reporting the condition of tools and equipment, your supervisor will guide you what to do if there is insufficient of tools and equipment to perform this particular work.

### 6.2. Service checking of tools, equipment and machinery

Tools, equipment and machinery shall be kept in proper operating condition and used only for the purpose for which they were designed. If proper and safe tools are unavailable, this should be reported to the supervisor. All tools, equipment and machineries should be inspected at regular intervals, and any tool that develops defects while in use shall be taken from service, tagged and not used again until restored to proper working condition.

| **Self-Check – 6** | **Written test** |
|---|---|

Name…… ID…… Date…….

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

**Test I: Short Answer Questions**

1. List the importance of service checking of tools, equipment and machinery? (1pts)

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

1. Tools, equipment and machinery shall be kept in proper operating condition and used only for the purpose for which they were designed. (2pts)

2. All tools, equipment and machineries should be inspected at regular intervals, and any tool that develops defects while in use shall be taken from service and not used again until restored to proper working condition. (2pts)

*Note:* Satisfactory rating - 5 points Unsatisfactory - below 5 points

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

**Answer sheet**

**Test I**

1._____

**Test II**

1._____

2._____

| LG #51 | LO #2- Operate and monitor the sorting and grading process |
|---|---|

| **Instruction sheet** |
|---|
| This learning guide is developed to provide you the necessary information regarding the |

following **content coverage** and topics:

- Sorting and grading spice and herbs by color, maturity and size
- Conducting work in accordance with legislative requirements and policies and procedure
- Monitoring sorting and grading equipment to identify variation in operating conditions
- Identifying and reporting variation in operation of equipment and processes
- Monitoring the process to confirm that particle size of stock meets specifications
- Identifying, rectifying and reporting out-of-specification product/process outcome
- Maintaining the work area according to housekeeping standards
- Maintaining workplace records
- Following workplace information and procedures

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**:

- Sort and grade spice and herbs by color, maturity and size
- Conduct work in accordance with legislative requirements and policies and procedure
- Monitor sorting and grading equipment to identify variation in operating conditions
- Identify and report variation in operation of equipment and processes
- Monitor the process to confirm that particle size of stock meets specifications
- Identify, rectify and report out-of-specification product/process outcome
- Maintain the work area according to housekeeping standards
- Maintain workplace records
- Follow workplace information and procedures

**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”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets”
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

**Information Sheet 1- Sorting and grading spice and herbs by color, maturity and size**

## 1.1. Sorting of spice and herbs

Sorting is the process of produce is usually done to eliminate injured, decayed, or otherwise defective produce (culls) before cooling or additional handling. Sorting of spice and herbs ensures the removal of inferior and/or damaged produce which are not fit for the processing purpose. Manual, automated or combined system could be used depending on the nature of the product and of the defect. For visible defects an inspection belt may be used with trained personnel who identify poor quality produce unsuitable for canning**.**

- For non-visible/internal defects several noninvasive technologies have been developed for the quality detection, such as magnetic resonance imaging, ultrasound, and infrared technologies.
- The automated systems improve the detecting efficiency and save labor costs

Sorting is a process of arranging spice and herbs systematically, to eliminate injured, decayed, or otherwise defective produce before going to additional or further processing. The sorting process serves as the first step to ensuring the purity and cleanliness of the spice and herbs. Sorting operation and has two common, yet distinct meanings:

- Ordering: arranging spice and herbs in a sequence ordered by some size, color. maturity and
- Categorizing: grouping spice and herbs with similar properties.

The dried product should be processed to remove the leaves from the stems and then sieved to remove dirt and to produce a uniform product. After drying, the leaves should be separated further from the stems, sieved and graded. Fresh produce should be clean of foreign material and with a fresh and crispy appearance and a good color and flavor. After the bulk amount of the desired plant part has been harvested or collected, all extraneous and unwanted matter including dirt (for example, soil, dust, mud and stones), impurities for example, insects, rotten tissues, untargeted/ extraneous medicinal plant and/or plant part, and residual non-medicinal as well as toxic part must be removed from the medicinal part. Although in some cases sorting may be done by mechanical means, it is usually done by hand. Only staff that are suitably trained and equipped for example, wearing gloves and a dust mask, etc. as appropriate should carry out this work.

**Sorting:** A preliminary sorting of produce should remove unmarketable pieces and foreign matters, such as plant debris, soil and stones, before the produce passes on to further operations. All discarded material should be quickly hauled away from the packing place. Raw materials are sorted on the basis of:

1. Weight Sorting
2. Color Sorting
3. Size Sorting
4. Shape Sorting

### 1. Weight sorting

Weight is usually the most precise method of sorting, as it is not dependent on the geometry of the products. Spice or herbs may be separated into weight categories using spring-loaded, strain gauge or electronic weighing devices incorporated into conveying systems. Using a series of tipping or compressed air blowing mechanisms set to trigger at progressively lesser weights, the heavier items are removed first, followed by the next weight category and so on. These systems are computer controlled and can additionally provide data on quantities and size distributions from different growers. An alternative system is to use the 'catapult' principle where units are thrown into different collecting chutes, depending on their weight, by spring-loaded catapult arms. A disadvantage of weight sorting is the relatively long time required per unit.

### 2. Size sorting by hands

Size sorting is less precise than weight sorting, but is considerably cheaper. The size and shape of spice and herbs units are difficult to define precisely. Size categories could involve a number of physical parameters, including diameter, length or projected area. Flatbed and rotary screens are the main geometries of the fixed bed screen and a number of screens may be used in series or in parallel to sort units into several size categories simultaneously. The problem with fixed screens is usually contacting the feed material with the screen, which may become blocked or overloaded. Variable aperture screens have either a continuous diverging or stepwise diverging apertures. These are much gentler and are commonly used with larger, more delicate items such as fruit. In our homes fixed aperture screen (sieve) are used for size sorting and in food industry screens of different dimensions are used.

### 3. Color sorting

Extremely high throughputs have been reported. By using more than one photocell positioned at different angles, blemishes on large units such as. Colour sorting can also be used to separate materials which are to be processed separately, such as red and green. It is feasible to use transmittance as a basis for sorting although, as most foods are completely opaque, very few opportunities are available. The principle has been used for sorting cherries with and without stones and for the internal examination, or 'candling', of eggs. Mostly, food colors that's his appearance attract the consumers so there is a higher price for the product. Manually labors on inspection belts or electric color sorter that scan the color are used in industry. Color sorters are used for food processing industry.

### 4. Shape sorting

Shape sorting useful in case where the food units are contaminated with particles of similar size and weight. Shape sorting is mostly done for the removal of contaminants from the raw material.

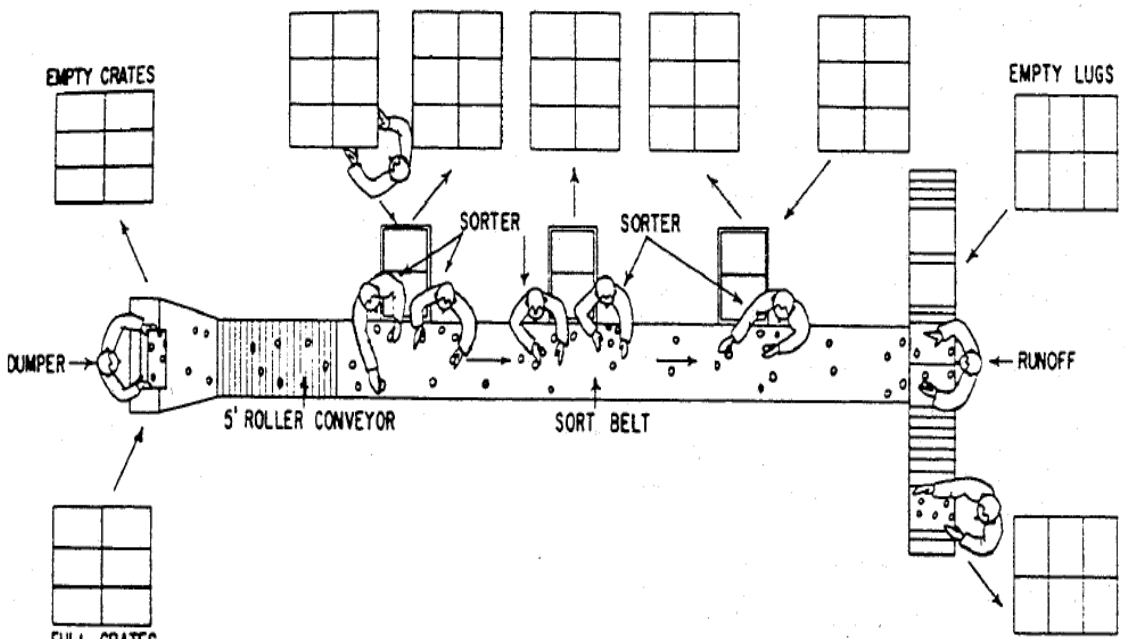



Figure 1.1. Sorting table

Under sorting operation of spice and herbs, injured, bruised, cut, over-sized, under-sized, decayed, shriveled spice and herbs are sorted out. After sorting, healthy lot is left free

from any unwanted subject. Spice and herbs are subjected for sorting manually or mechanically placing them on running belt.

- Sorting ensures the removal of inferior and/or damaged produce which are not fit for the purpose
- Manual, automated or combined system could be used depending on the nature of the product and of the defect
- For visible defects an inspection belt may be used with trained personnel who identify poor quality produce unsuitable for canning.
- The automated systems improve the detecting efficiency and save labor costs
- Removal of all produce that is physically damaged or infected with pests and diseases
- Removal of produce that is not true to type (misshapen, wrong color, etc.)
- Removal of produce that is dirty.

Figure: 1.2. Sorting of ginger

### 1.2. Grading of spice and herbs

Grading is the grouping or sorting of the harvested spice and herbs raw materials based on some standards to eliminate all unsatisfactory products. The separation of harvested products from the bulk into different categories, on the basis of size, color, shape, etc., is called grading. Grading is done based on some specified standards, such as size, color, shape, texture, varieties, maturity, blemishes and etc. It can be done visually or mechanically.

- **Advantage of grading**

✓ Grading and standardization play an important role in marketing of spice product including herbs. It is a well-known fact that spices and herbs exhibit wide variations in quality due to a number of factors such as the varietal differences, varying agro-climatic conditions of growth, different methods of processing and preparation for market, etc. Further spices and herbs being perishable/semi-perishable by nature, changes in quality do occur during storage, also the quality requirements for different end uses of the same commodity also differ considerably. Obviously, therefore, grading and standardization become the essential pre-requisite for ensuring the quality of product to the consumer.

✓ Grading also helps the spice and herbs producer in realizing price commensurate with the quality of the produce.

✓ Grading and standardizing no doubt make a major contribution to the improvement of marketing system of spices and herbs by establishing a common international trade language. Under an efficiently managed grading and standardization program, transactions can take place on the basis of recognized grade standards rather than on samples which often lead to disputes.

✓ The time consuming and wasteful practice of physical inspection of the consignment at different sales points can be avoided and efficiency of marketing considerably improved when scientific grading of spices and herbs is adopted as an integral part of the marketing strategy.

✓ When the transactions are on the basis of well-known grades, the collection and dissemination of market prices become more accurate and meaningful. Thus, it would not be unreasonable to state that grading and standardization constitute the single most powerful measure that brings about an overall improvement in not only the marketing system of spices and condiments but also, in the long run, the quality of spice and herbs production in the country by creating quality consciousness among the growers as well as the consumers.

- **Factors to be considered during grading:-**

Harvested products of spice and herbs are graded into different categories on the basis of following quality parameters:-

- ✓ Uniformity in size, shape, color and ripeness.
- ✓ Uniformity in appearance.
- ✓ Variety
- ✓ Moisture content.
- ✓ Good visual appearance (absence of visual defects).

Grading help to;

- ✓ Eliminate all unsatisfactory items (defects)
- ✓ Increase the quality and storage life of the harvested products
- ✓ Attract markets and obtain high sell price
- ✓ Minimize contamination of the product from pests and disease.

Produce that does not meet specifications for the further processing or the target market, or the enterprise grading standard is referred to as Reject Produce.

Table: 1.1. The reasons for rejection

| Grade parameter | Possible problems | | |
|---|---|---|---|
| Size | Too big or Too small | Too fat or too thin | Too long or too short |
| Shape | Irregular | Curved | Not true to type |
| Ripeness | Too ripe or too green | Unevenly ripe | Mixed stages of ripeness |
| Maturity | Over mature | Not mature enough | |
| Damaged | Bruised or Squashed | Cracked or russet marked | Wind or hail damaged |
| Infected | Rotting | Insect damaged | Quarantine pest |

### 1.2.1. Grading of pepper

In well-known spice processing area, pepper is cleaned and graded with the help of a multiple-sieve-cum-air-classifier type of machine whereby the following fractions are conveniently and quickly obtained:

- Dust
- Stalks
- Pinheads
- Hollows
- Immature pepper
- Ripe pepper and
- Extra-bold pepper.

The separated pepper is then washed and dried in order to make it free of any adhering fungus and other extraneous matter. Alternatively mechanical brushing between two rotating brushes can be used both to clean the pepper and to impart nice shine to it. To sum up the above techniques of processing of pepper, technically consists of four steps;

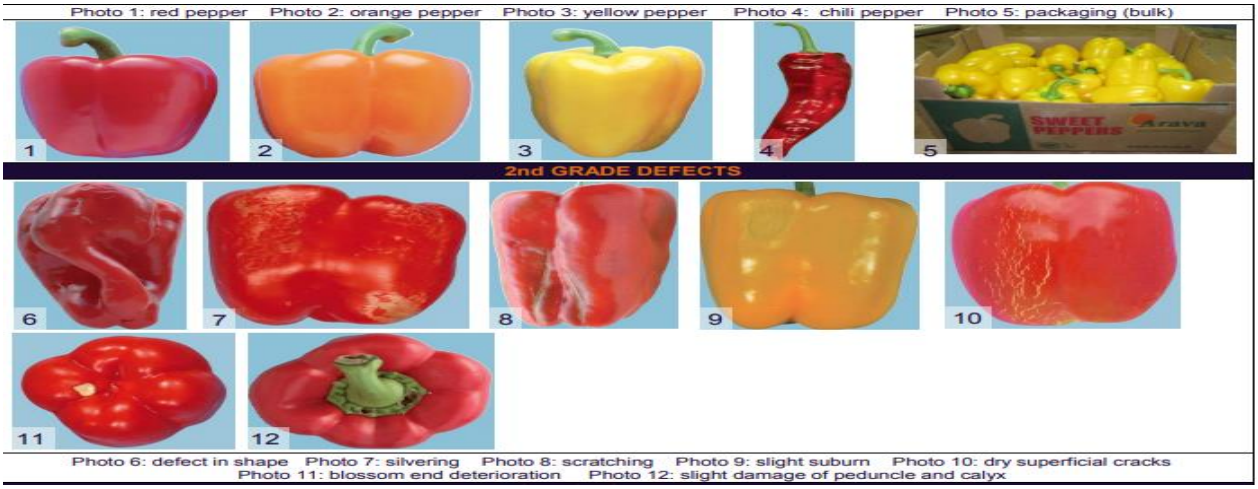
(1) Drying,

(2) Separation of various fractions,

(3) Size segregation or grading and

(4) Physical cleaning and finally packaging.

It should be possible to cover the first four steps in one operation by using a pneumatic conveyer-cum dryer. Such mechanical cleaners-cum-graders should be installed near the producing areas or in the ' assembling or regulated markets so that only properly cleaned and graded spices are offered for auction. Likewise, de-stoners, air classifiers, gravity separators, color graders and sieve graders of proper capacity should be installed for the benefit of the processer, sellers and buyers. A single mechanical machine composed of clippers, air classifiers, polisher, specific gravity or size grader and inspection table, with a capacity of 8 to 5 tons of seed spices per shift of 8 hours, is available and is being used in some exporting and importing countries.




**Key**:1red pepper;2 orange pepper;3 yellow pepper;4chili pepper;5 bulk pepper;6 defected pepper;7 silvering;8 scraching;9 slight suburn;10 dry superficial cracks;10 dry superficial cacks;11blossom end deterioration;12 slight damage of peduncle and calyx

**Figure: 1.3. Grading of pepper**

### 1.2.2. Grading of cardamom

Dried cardamoms are cleaned by rubbing them gently over a coarse surface of wire mesh or bamboo trays in order to remove parts. The stalks and all dried remain of floral parts. This is best done when the material is still hot. The cleaned or sorted cardamoms are then graded into longs, mediums and shorts. Cardamom capsules should be sorted into size classes and different size sieves will allow different grades to be separated as well as the separation of split and insect infested capsules. Cardamom is graded on the basis of color, clipping (i.e. pods with the tips trimmed), size, whether bleached or unbleached, the proportion of extraneous matter present, and product origin.

Common Grades In general, the weight in grams per liter and the color are decisive in determining quality. The Proportion of burst fruit pods ("open pods") also determines quality, as do color (green or yellow) and drying method (mechanical or sun). The following definitions refer to common grades:

- Bold is a popular export grade where 90 percent of the cardamom pods have a diameter of 6.5mm or above and product has a mature green coloration.
- Super bold is a high quality variety where all pods should have a diameter of 8mm or above and the product has a mature green coloration.
- Extra bold is also a popular export grade where all pods will have a diameter of 7 mm or above and the product has a mature green coloration.
- Bulk is cardamom that has not been graded. As such, it contains all sizes, both mature and immature capsules, as well as black, yellow and/or split cardamom.
- Small is a grade with pods that measure between 5.5 mm and 6.5 mm in diameter.
- Open/splits is lower quality cardamom where over 60 percent of the pods are “open” (i.e. seeds exposed) and the color of the pods may be greenish/pale yellow. All pods will be mature with a diameter of 6.5 mm or above.
- Seeds are the black/brown seeds of the cardamom pods (i.e. husk fully removed). Fruit are generally over matured pods with slight yellowish in color.

Figure: 1.4. Grading of Cardamom

Figure:1.5 Green cardamom

Figure:1.6 Infected caradmom



Figure:1.7 Color grading of cardamom

### 1.2.3. Grading of cinnamon

Cinnamon barks are also sorted out and graded into quills, quillings, featherings and chips, based on their length, unit weight, color, taste, texture, thickness. There are 4 types of products from Cinnamon bark:

- **Quills**: the first grade cinnamon bark product, with 90 – 100 cm length.
- **Quillings**: the broken pieces of quills and fragments of quills are bulked, packed and sold as. These are broken pieces of quills used mainly for grinding but also for distillation of oil. The pieces vary considerably in size, being about 5 to 15 or 20 cm in length and about 10 to 25mm in diameter.
- **Featherings**: consists of barks of twigs and twisted shoots which will not give straight quills of normal length. These are short shavings and small pieces of left overs in the

processing of the inner bark into quills. Collectively, featherings present a shade darker color than the quills and a shade lighter than the chips.

- **Chips**: includes the trimmings of the cut shoots, and shavings of outer banks which cannot be separated. These are small pieces of bark, greyish brown on the outside and a lighter brown on the inside. They are deficient in both aroma and taste and are not to be compared to the quills for flavor.

**Chips are graded into 2 categories**,

- Grade 1 - Those containing small featherings obtained by scraping very small twigs.
- Grade 2 - Those containing inner and outer bark and pieces of wood.


Figure: 1.8. Grading of Cinnamon

### 1.2.4. Grading of ginger

Dried, unbleached ginger rhizomes are gently rubbed by hand in order to remove the last bits of the skin or any adhering extraneous matter. They are then sorted in to suitable grades prescribed under the various national standards such as those of the U.S. Department of Agriculture, the Food and Drug Administration, ASTA, National Standards, which vary somewhat from country to country. Quality specifications are imposed by the importing country and refer to the cleanliness specifications of the ginger rather than the quality. It is important to meet the minimum standards or the ginger will be rejected by the importers.

Table: 1.2. Different grade of ginger

| Type | Description |
|---|---|
| Peeled, scraped, uncoated | Whole rhizome with the corky skin removed |
| Rough scraped | Whole rhizome with the skin partially removed |
| Unpeeled, coated | Whole rhizome with the skin intact |
| Black ginger | Whole rhizome scalded before being scraped and dried |
| Bleached | Whole rhizome treated with lime of diluted sulphuric acid |
| Splits and slices | Unpeeled rhizomes, split or sliced |
| Ratoons | Second growth rhizomes, small, dark and very fibrous |

Figure: 1.9. Grading of Ginger

### 1.2.5. Grading of onions

In the United States, most onions are graded in central packing sheds and warehouses, which are usually located along railroad sidings, where the bagged onions are run, aver power-operated mechanical graders that blow and screen out any dust and loose scales and grade the onions into different sizes. As the bulbs move along the grading table, undesirable ones are removed. Usually the several size grades are packed separately to make a more uniform and attractive product. Portable onion graders, which allow cleaning, grading and sacking in the field, are also used in some areas.

Figure: 1.10. Grading of onion

### 1.2.6. Grading of turmeric

The adhering scales and root bases or hairy roots arc removed from cured and dried turmeric rhizomes (bulbs and fingers) by rubbing with the help of a coarse cloth or burlap, followed by winnowing. The cleaned product is then graded into Finger bulbs, broken, etc.

Figure: 1.11. Grading of Turmeric

### 1.2.7. Grading of vanilla beans/cuts

Vanilla beans, after curing, are graded according to length and appearance. However the system of grading of vanilla beans does not appear to be consistent. There are four grades;

- Top class beans are cut up to 20cm in length, very dark, oily in appearance, show no defects, and have a good, powerful odor.
- Second grade. The lower grades are short, thinner, and lighter in color and the odor is not so pronounced.
- Splits. When the beans are open at the end during the curing process, they are graded as "splits". Very thin pods are often combined with these.

- Cuts. If the beans have developed mould, then the mouldy portion is cut away and the rest is sold as cuts.

Figure: 1.12. Grading of vanilla

### 2.2.8. Grading clove

Cloves, which are the unopened flower buds, are produced on the terminal shoots of the twigs. The buds are collected when they are dull red or pink in color and less than 2 cm long. The inflorescence is harvested without damaging the branches when the buds have reached their full size, but before they open, so that the petals together with the stamens inside form the head of the dried clove. Delayed picking, i.e., after the opening of the buds, will devalue the spice. Grading whole cloves are graded as

- Special (Hand-picked),
- Grade-2,
- Grade-3,Ground (powdered) cloves,
- While the defective cloves are named as khoker cloves, headless cloves, mother cloves, extraneous matter, etc.

Figure: 1.13. Grading of clove

### 2.2.9. Grading of garlic

After curing, the garlic tops and the roots should be trimmed. Topping and root trimming can be done mechanically or by hand. Brushing to remove the loose outer sheath is the final step before processing. Garlic is usually graded by size, with the larger-sized bulbs commanding a higher price. The grading process can also be done manually or mechanically. Garlic bulbs after curing are run over a grader or graded manually before their storage or marketing. The thick- necked, splitted, injured, and diseased or bulbs with hollow cloves are sorted out. Size grading is done after sorting. It is very much necessary for getting better price and to minimize losses on account of drying and decay. The grade designations and definition of different qualities of garlic have been prescribed. Some pointers:

- Garlic for processing: all garlic is good to process, regardless of the size, shape or condition (unless it's full of mold!) You'll want to use bulbs that have torn or damaged wrappers, or exposed clove skins, as eating garlic first.
- Garlic for seed: healthy is the main criteria. No blemishes, knicks, cuts, mold or severe deformities. Avoid double cloves (cloves that are not clearly differentiated from one another) if possible, unless you like how they look when they grow in the garden. Big cloves yield big bulbs, to a point. A healthy, strong, medium sized bulb can yield good size bulbs too.


Figure:1.14 Grading of garlic

| Self-Check – 1 | Written test |
|---|---|

Name…… ID…… Date…….

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

**Test I: Short Answer Questions**

1. Define grading?(2pts)

2. Define sorting? (2pts)

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

1. Grading is the grouping or sorting of the harvested spice and herbs raw materials based on some standards to eliminate all unsatisfactory products. (2pts)

2. Sorting ensures the removal of inferior and/or damaged spice raw materials which are not fit for the purpose. (2pts)

***Note:*** **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

**Answer sheet**

**Test I**

1._____

2._____

**Test II**

1._____

**Information Sheet 2- Conducting work in accordance with legislative requirements and policies and procedure**

## 2.1. Conducting work according with legislative

Sorting and grading of spice and herbs should be conducted according food standards code, including labeling, weights and measures legislation covering food safety, environmental management, OHS, anti-discrimination and equal opportunity. Every operator or processer has a legal and moral responsibility to ensure that processed spice and herbs offered for human consumption is safe to eat. Risks to food safety can be minimized if basic good processing and good hygiene practices are followed in processing and throughout the postharvest handling operations.

Legislative are applicable to all the spice and herbs sorting and grading operators at all stages in the processing of spice and herbs products and without prejudice to more specific requirements relating to food hygiene. The regulation reinforces the responsibility to ensure food safety and lays down general rules for the in the hygiene of food taking particular account of the following principles:- primary responsibility for spice and herbs safety rests with the sorting and grading operation-necessity to ensure food safety throughout the processing chain starting from the primary production-Provide assurance by the sorting and grading operation that the food is fit for human consumption and maintain confidence in nationally and Internationally traded food-spice and herbs which cannot be stored at ambient temperature shall be under controlled conditions. Implementation of procedures based on the HACCP principles (Hazard Analysis Critical Control Points), fully supported with Good Hygiene Practices (GHPs) that are necessary to maintain hygienic environment throughout the food chain, suitable for the production, handling and processing of clean and safe end product, fit for human consumption. Ensure consumers" clear and transparent information through proper sorting and grading about the use and handling of the products for safe consumption.

In the processing area the rules and procedures for Food Hygiene and Handling Produce are usually documented and available for staff reference. You should be aware of the sorting and grading rules and work procedures and ensure that the rules and procedures are known, understood and implemented by all the workers in your team. In relation to sorting and grading procedures; methodology and standards are based on the type of

produce, operation circumstances, (scale of operation and equipment available), Industry Good Practices and Client or market requirements.

## 2.2. Conducting work with policy and procedure

Work is carried out according to company policies and procedures, regulatory and licensing requirements, legislative requirements, and industrial awards and agreements. Adaptability & scalability of best practices to improve the quality & safety standards' for spices & spices products can be heavily contaminated with micro-organisms and can be below standards because of the environmental and processing conditions under which they are produced. Ensuring the safety of these products, hence food safety, and comply with standards is a first step to enter global market. As a result of this, countries with well-established food safety assurance systems could export and trade their products without any barriers and become competitive in the global trade.

In Ethiopia regulatory system is very little developed and is not able to effectively support the production, supply & distribution of safe and quality spice products to the domestic consumers and to the export market. By large, regulating food safety is a shared responsibility of Ministry of Health, Ministry of Agriculture and Ethiopia Standards Authority. Food, Medicine and Health Care Administration and Control Proclamation No. 661/2009 and the establishment of Ethiopian Food, Medicine and Health Care Administration and Control Authority under Regulation No, 189/2010 are important milestones in institutionalizing the legal system and hence better reacting to contemporary situation. In connection with this Ethiopian Standards Authority has prepared standards, identical with ISO, for major spices to this end it is possible to sum up there is yet more to be done in policies and regulatory activities in assuring the quality and safety of food and food additives supplied to domestic consumers and foreign markets. Making the policies more robust and avoiding fragmented linkages among the regulatory body and help them function very well by providing legal and structural framework through formulation and benchmarking with best practice countries is widely requires public intervention.

## Hazard Analysis Critical Control Point (HACCP):

HACCP allows processors/regulator to look at what happens during the process to ensure safety. Major Concepts of HACCP;

1. A preventive system of control particularly on biological hazards
2. A system approach for estimating the risk in producing a food product
3. Universally recognized system as the most effective way to prevent food borne illness
4. Science - based systematic, identified specific hazards and measures for their control to ensure food safety
5. Capable of accommodating change, such as advances in equipment design, processing procedures, or technological developments that can be applied throughout the food chain from the primary producer to the final consumer
6. Applicable to establishments that produce, process, treat, pack, trade, transport, serve, or involve in food production

## Seven (7) HACCP Principles

1. Hazard analysis
2. Identify critical control points
3. Establish Control limits
4. Monitor critical limits
5. Establish corrective actions in case of deviation from established critical limits
6. Establish verification procedure to ensure that the system is consistent
7. Establish record keeping procedures

## General Hazards Characteristics

- The product contains sensitive ingredients, which can be assumed as potential sources of contamination under normal circumstances.
- The manufacturing process does not contain controlled processing steps that effectively destroy harmful bacteria.
- There is substantial potential for microbiological abuse in distribution or in consumer handling that could render the product harmful when consumed.
- Product is subject to contamination after processing and before packaging.
- No terminal heat process after packaging.

## HACCP Pre-Requisite Programs

Good Manufacturing Practices (GMP): GMPs are systems put in place to ensure that food prepared in a plant is sound and free of contamination. GMPs include:

- Plant grounds and building facilities emphasize pest control;
- Equipment design provides ease in cleaning and maintenance;
- Personal hygiene practices and facilities are set;
- Storage and warehousing are free from contamination.

  Sanitation Standard Operating Procedures (SSOP): SSOP are components of GMP that emphasize sanitation procedure. They include:

  - Safety of water that gets in contact with food and food surfaces;
  - Measures to prevent contamination;
  - Employee hygiene practices;
  - Control of employee health conditions that could result in contamination of food and food surfaces;
  - Protection of food and food contact surfaces from adulteration with toxic and other harmful components;
  - Proper labelling and storage and use of toxic; and Control of pests.

| 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: Short Answer Questions**

1. List down the importance of conducting work according with legislative?(2pts)

2. List down the importance of conducting work with policy and procedure? (2pts)

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

1. Every operator or processer has a legal and moral responsibility to ensure that processed spice and herbs offered for human consumption is safe to eat. (2pts)

2. In Ethiopia regulatory system is very little developed and is not able to effectively support the production, supply & distribution of safe and quality spice products to the domestic consumers and to the export market. (2pts)

***Note:*** **Satisfactory rating - 7 points** **Unsatisfactory - below 7 points**

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

**Answer Sheet**

Name: _____ Date: _____

**Answer sheet**

**Test I**

1._____

2._____

**Test II**

1._____

2. _____

**Information Sheet 3- Monitoring sorting and grading equipment to identify variation in operating conditions**

### 3.1. Monitoring sorting and grading equipment/machine

Equipment used in the sorting and grading of spice and herbs varies widely according to the specific produce, its intended use, the nature of any particular enterprise and the point that produce has reached within the post-harvest processing system. This topic over views the wide variety of sorting and grading equipment/machine used in steps from harvest to consumption. Equipment should be designed to facilitate cleaning and disinfection with little or no water and, when wet cleaning is required, to allow thorough drying before reusing the equipment for spices and dried aromatic herbs. Alternatively the design should allow disassembly such that parts can be taken to a room designed for wet cleaning and disinfection, when applicable. The equipment design should be as simple as possible, with a minimal number of parts and with all parts and assemblies easily accessible and/or removable for inspection and cleaning.

Equipment should not have pits, cracks, corrosion, crevices, recesses, open seams, gaps, lap seams, protruding ledges, inside threads, bolt rivets, or dead ends. Hollow areas of equipment as well as cracks and crevices should be eliminated whenever possible or permanently sealed. Items such as bolts, studs, mounting plates and brackets should be continuously welded to the surface and not attached via drilled and tapped holes. Welds should be ground and polished smooth. Push buttons, valve handles, switches and touch screens should be designed to ensure product and other residues (including liquid) do not penetrate or accumulate in or on the enclosure or interface. Equipment should be installed so as to allow access for cleaning and to minimize transfer of dust particles to other pieces of equipment or to the environment. The risk of contamination from equipment should be assessed and controlled. Wherever possible, forklifts, utensils, and maintenance tools for the finished product and packaging areas should be different from those used in the “raw” material area (e.g. prior to the microbial reduction treatment).

Equipment should be designed to facilitate cleaning and disinfection with little or no water and, when wet cleaning is required, to allow thorough drying before reuse of the

equipment for spices. Alternatively, the design should allow disassembling such parts that can be taken to a room designated for wet cleaning and disinfection, where applicable.

- The equipment designed should be as simple as possible, with a minimal numbers of parts which are easily accessible and/or removable for inspection and cleaning.
- Equipment should not have pits, cracks, corrosion, crevices, recesses, open seams, gaps, lap seams, protruding ledges, inside threads, bolt rivets, or dead ends. Hollow areas of the equipment as well as cracks and crevices should be eliminated whenever possible or permanently sealed.
- Equipment should be installed so as to allow access for cleaning and to minimize transfer of dust particles to other pieces of equipment or to the environment.
- The risk of contamination from equipment should be assessed and controlled. Wherever possible, forklifts, utensils, and maintenance tools for the finished product and packaging areas should be different from those used in the “raw” material area.
- Equipment and containers that come in contact with food and used for handling, storage, processing and packaging shall be made of corrosion free materials which do not impart any toxicity to the food material.
- Equipment and containers for waste, by-products and inedible or dangerous substance, shall be specifically identifiable and suitably constructed.

| 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: Short Answer Questions**

1. List down the importance of conducting work according with legislative? (2pts)

2. List down the importance of conducting work with policy and procedure? (2pts)

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

1. Every operator or processer has a legal and moral responsibility to ensure that processed spice and herbs offered for human consumption is safe to eat. (2pts)

2. In Ethiopia regulatory system is very little developed and is not able to effectively support the production, supply & distribution of safe and quality spice products to the domestic consumers and to the export market. (2pts)

***Note:*** **Satisfactory rating - 7 points** **Unsatisfactory - below 7 points**

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

**Answer Sheet**

Name: _____ Date: _____

**Answer sheet**

**Test I**

1._____

2._____

**Test II**

1._____

2. _____

**Information Sheet 4- Identifying and reporting variation in operation of equipment and processes**

## 4.1. Identifying variation in operation of equipment

Spice sorting and grading processes have many factors that influence their success, and in each, the possibility of variation is introduced. The specific types of variation depend on what is being processed -for example, an adhesive is affected by factors unlike those that affect a machine. In general, however, the outcome-specific factors fit into five major areas.

### 4.1.1. Variation due to raw materials

All the processes begin with raw materials, whether it's ore from the ground or the end result of previous manufacturing processes. If the raw materials change, that change can create variations in the overall process. There might be a difference in quality from the same supplier, which may fall within the specified limits but is still enough to cause variation in the next process, or material from a different supplier may not be identical to the one from the first supplier.

### 4.1.2. Variation due to equipment

Whether a manufacturing process uses simple or complex equipment, changes in the equipment can cause variation. Variations occur with the use of more than one piece of equipment to complete the same task because even two pieces of equipment bought at the same time from the same company will not always behave exactly the same over time. Variations are also introduced in the performance of an individual piece of equipment, which can begin to break down or drift from the calibration point.

### 4.1.3. Variation due to human actions

Humans are by nature variable. Even with the best controls, an individual operator can have a bad day and introduce variations from one day to the next. Two different operators trained in the same way might have slightly different actions or criteria for decision making, which causes variation. Not all variation caused by human action can be considered human error, although that possibility also exists.

### 4.1.4. Variation due to environment

Changes in temperature and humidity affect various processes and some agro-food processes require a clean room environment and the introduction of particles from outside the clean room can cause variation. Changes in the environment have the ability to trigger changes in raw materials, equipment and human action, even if the environmental changes do not directly affect the manufacturing process.

### 4.1.5. Variation due to method

A manufacturing process is defined by a series of steps. Variation can be introduced if the time between the executions of the steps changes, the order of the steps changes, one is missed or a change is made in carrying out the step -- for example, if the step says to heat to a certain temperature but a different one is selected. Some variations in method can be tracked to variations in human action, but others may be approved alternatives.

## 4.2. Reporting variation of equipment

If sorting and equipment or machine loose rapid speed of operation, high accuracy of positioning, high structural rigidity, flexibility of operation, user friendliness and safety, you should report to your supervisor or manufacturer to maintaining according to manufacture guidelines. Each piece of equipment/machine which required maintenance should have reported to the concerned person/supervisor/ manufacturer.

Table 4.1. Maintenance reporting format

| Date: | | Period of Report: | | | | | |
|---|---|---|---|---|---|---|---|
| S. No. | Name/Code No. of the Machine/ Equipment | Location | Nature of Breakdown | Details of repairs carried out | Breakdown Period | Work Done by | Remarks |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

| 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: Short Answer Questions**

1. List down the five specific factors that create variation of equipment? (2pts)

2. List down the importance knowing variation? (2pts)

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

1. Changes in the environment have the ability to trigger changes in raw materials, equipment and human action. (2pts)

2. If the raw materials change, that change can create variations in the overall process. (2pts)

***Note:*** **Satisfactory rating - 7 points** **Unsatisfactory - below 7 points**

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

**Answer Sheet**

Name: _____ Date: _____

**Answer sheet**

**Test I**

1._____

2._____

**Test II**

1._____

2. _____

## Information Sheet 5- Monitoring the process to confirm that particle size of stock meets specifications

### 5.1. Monitoring the process

It has been repeatedly stressed in this topic that high quality finished products can never be made from poor quality raw materials. Although all stages in a process are important, errors in early stages build up, becoming larger problems later, which cannot usually be corrected. Careful attention to the initial stages of a process is therefore very beneficial in maintaining quality.

### 5.2. Monitoring quality issues

The quality of the raw material used in the processing industry determines to a large extent the quality of the finished product. Raw materials of poor quality cannot be expected to result in a final product of high quality even with the best processing methods. Therefore, gaining an understanding of the nature of the raw material and of its possible defects is an essential step in building quality into a product. Likewise thorough knowledge of the likely effects of defects, defective raw materials on both processing efficiency and quality of finished product is important. After about a week or when they have dried thoroughly, the raw materials are topped by cutting off leaves and roots with shears. Diseased and damaged raw materials are sorted out in the field. The raw materials of a variety should be thoroughly sorted and graded.

### 5.3. Particle size of stock.

Many spices and herbs are ground to give easier dispersion in the final food product. This process also aids the dispersion of flavor. Particle size is generally specified and is carried out using standardized sieves. Aperture sizes give a particle size, the products being ground to pass a certain sieve, and coarse matter recycled through the mill until it finally passes through the sieve. Sieves are characterized in micron sizes and typical requirements will be a 95% pass on a specified size of sieve. The older method of measuring sieve (hole) sizes was that of mesh which related to the number of holes per inch. However, confusing differences exist between American and British mesh sizes. The mesh size (number of holes per inch) depends on the diameter of the wire making up the sieves and this differs between nations.

| Self-Check – 5 | Written test |
|---|---|

Name…… ID…… Date…….

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

**Write true if the statement is correct and false if the statement is incorrect**

1. The quality of the raw material used in the processing industry determines to a large extent the quality of the finished product. (2pts)

2. Careful attention to the initial stages of a process is therefore very beneficial in maintaining quality. (2pts)

***Note:*** **Satisfactory rating - 4 points** **Unsatisfactory - below 4 points**

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

**Answer Sheet**

Name: _____ Date: _____

**Answer sheet**

1._____

2._____

## Information Sheet 6- Identifying, rectifying and reporting out-of-specification product/process outcome

### 6.1. Identifying and rectifying out-of-specification product/process outcome

The organization shall establish and maintain documented procedures that specify appropriate actions to identify and eliminate the cause of detected nonconformities, to prevent recurrence, and to bring the process or system back into control after non conformity is encountered. All out-of-specification products must be clearly identified, rectified, and reported to prevent unauthorized release. Identifying, rectifying and reporting of out-of-specification adhere to the following guidelines for control of non-conforming product.

**Out- of-specifications during sorting and grading:**

- Out of specification of the product, such as undesirable variety, off flavor, off aroma, not true type shape, too big or too small size, too long too thin, under or over weight, no true to type color, over maturity or not enough mature, too high or too low moisture content, too ripeness or unripen, rotten, insect damaged, bruised, cracked and contaminated.

The client may also specify the packaging materials, type of containers, filling techniques, labeling and storage requirements from field to client such as the cool chain concept. This means that sorting and grading is a skilled operation requiring workers to have good observation skills, the ability to make quick decisions to accept or reject, fast reflexes and good hand eye coordination. Workers engaged in sorting and grading are often but not exclusively female.

### 6.2. Reporting out-of-specification product/process outcome

- Products that are reported as non-conforming (undesirable particle size; present of on products mould, spoilage, micro-organism, over and under matured, un-recommended moisture content and etc.)
- Clearly label and isolate “on hold” products so that they are not accidentally released.
- Products should only be released after necessary controls are made and specification limits are achieved.
- If non-conformance does not affect the use or safety of the product, then corrective action completes the response.

- If non-conformance affects the safety of the product, recall is initiated with management approval.
- Until the recall is completed, products from the same lot cannot be shipped and must be quarantined.
- Determine the corrective action required to eliminate non-conformance of future product, i.e., through re-work or other means. Upon completion, re-check the quality of the product to ensure the elimination of the non-conformance and seek approval for shipment.

| Self-Check – 6 | Written test |
|---|---|

Name…… ID…… Date…….

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

**Write true if the statement is correct and false if the statement is incorrect**

1. All out-of-specification products must be clearly identified, rectified, and reported to prevent unauthorized release.(2pts)

2. Products that are reported as non-conforming (undesirable particle size; present of on products mould, spoilage, micro-organism, over and under matured, un-recommended moisture content and etc). (2pts)

*Note:* Satisfactory rating - 4 points Unsatisfactory - below 4 points

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

**Answer Sheet**

Name: _____ Date: _____

1. _____
2. _____

## Information Sheet 7- Maintaining the work area according to housekeeping standards

### 7.1. Maintaining work area housekeeping

Good housekeeping is the foundation of a safe, healthy and pleasant workplace. It is essential that all areas be kept clean, orderly, and with all necessary things in the proper places. Employees should be aware of hazards arising from poor housekeeping. Good housekeeping improves safety, efficiency and quality at the same time.

- **Housekeeping Guidelines**
  - ✓ Keep work areas neat and clean.
  - ✓ Place tools, equipment and supplies in their correct places.
  - ✓ Implementing cleaning schedules for the area
  - ✓ Removing wrapping and packaging waste
  - ✓ Storing all product as soon as possible after delivery
  - ✓ Remove potential hazards
  - ✓ Keep the area clear for future deliveries
  - ✓ Keeping stores area well and ventilated to deter pests and allow for easy identification of product items and problem issues
  - ✓ Keeping shelves, benches, pallets, bins and other storage containers in good order and inspecting the area and fittings on a regular basis for signs of damage or deterioration or other problems such as stability, security and pest infestation
  - ✓ Maintaining all equipment and storage areas in accordance with the relevant occupational health and safety requirements.
  - ✓ Checking the temperature of refrigerated food storage areas
  - ✓ Initiating preventative maintenance servicing for plant and equipment in the stores area before servicing them
  - ✓ Developing and implementing a proper cleaning schedule for the stores areas including ensuring supplies of all necessary chemicals and equipment exist to get the job done

| Self-Check – 7 | Written test |
|---|---|

Name…… ID…… Date…….

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

**Short Answer Questions**

1. What is the good housekeeping? (2pts)

2. List at least 4 housekeeping guideline? (3pts)

*Note:* Satisfactory rating - 5 points Unsatisfactory - below 5 points

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

**Answer Sheet**

Name: _____ Date: _____

1. _____
   _____

## Information Sheet 8- Maintaining workplace records

### 8.1. Maintaining workplace record

Accurate records are essential for evaluating your sorting and grading operation. Accurate analysis requires accurate data. Operational/ workplace records about products and practices can be helpful to firms. First, such records help ensure consistency of production/sorting and grading processing operations and end-product quality and safety. They are more reliable than human memory and serve as a useful tool to identify areas where inconsistencies occur in operations and corrective actions or employee training may be needed.

Furthermore, maintaining adequate documentation and records could assist in identifying or ruling out potential contributing factors of contamination if product implicated in an outbreak is traced to a particular farm or facility. Every workplace is different and requires different types of information to keep it running smoothly, efficiently and profitably. Different sorting and grading processing operation of spice and herbs and by using different types quality raw materials should be recorded for future use as reference. Workplace records in operating sorting and grading of spices and herbs include:

- Quantity of raw material
- Quantity control of raw material
- Sorting and grading equipment/machine
- Sorting and grading methods
- Primary processing condition
- Employee training records
- Equipment monitoring and maintenance records
- Calibration records
- Sanitation records
- Product processing batch records
- Corrective action records
- Pest control records
- Distribution records
- Inspection records (e.g., incoming product, facility, production area)
- Microbiological contamination records (e.g., food contact surfaces, equipment)

| Self-Check – 8 | Written test |
|---|---|

Name…… ID…… Date…….

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

**Short Answer Questions**

1. Why maintain work place records?(2)

2. Write some workplace records during sorting and grading of spices and herbs?(3)

*Note:* Satisfactory rating - 5 points Unsatisfactory - below 5 points

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

**Answer Sheet**

Name: _____ Date: _____

1. _____
2. _____
   _____

## Information Sheet 9- Following workplace information and procedures

### 9.1. Following workplace information and procedures

When conducting sorting and grading follow standard operation procedure, specification, operational instructions describing each sorting and grading procedure, sanitation procedure, manufacturers' advice how to use equipment and machine to task, the frequency with which each procedure is performed, and the need to record the identity of the person(s) responsible for the implementation of the tasks. Maintain the condition and cleanliness of raw material contact surfaces, including utensils, gloves, and clothing, prevention of cross contamination from insanitary objects to food, and from raw product to processed product.

Sorting and grading operation plan and or the contract with the client will list the client specifications for the produce to be sorted and graded for the client or for further processing.

**Specifications may include some or all of the following:**

- Quality of plant produce that is acceptable, such as variety, shape, size, weight, length, color, maturity, moisture content, ripeness, texture, skin condition, blemishes, bud count and health which are subject to seasonal and market forces.
- The client may also specify the packaging materials, type of containers, filling techniques, labeling and storage requirements from field to client such as the cool chain concept. This means that sorting and grading is a skilled operation requiring workers to have good observation skills, the ability to make quick decisions to accept or reject, fast reflexes and good hand eye coordination. Workers engaged in sorting and grading are often but not exclusively female.

**The sorting and grading operation also needs good supervision;**

The consequences of mistakes in sorting and grading can be serious:

- Inclusion of sub-standard produce will upset the client and can result in reduced or cancelled orders for future sales.

- The inclusion of damaged or diseased produce may result in rotting during transport and distribution again leading to a dis-satisfied client, loss of reputation and loss of future sales.
- Inclusion of produce infected with Quarantine pests, e.g. Helicoverpa caterpillar in produce for export will result in the whole shipment being rejected and destroyed on arrival in the receiving country.

The role of the supervisor of the sorting and grading operation requires the supervisor to:

- Explain and demonstrate to the sorting and grading team.
  - ✓ The product specifications (Pictures and produce samples are helpful for this task),
  - ✓ How to present and or pack and label their graded produce.
  - ✓ How to handle the produce to minimize physical damage
  - ✓ How to organize their work station to prevent reject produce and graded produce becoming mixed.
- Make follow up and observe the work of the sort and graders closely to see that the instructions have been understood and are being implemented.
- Check that batched of produce is kept separate and is labeled.
- Record the pack out rate (Total Produce Weight and Weight of Produce that meets the client specifications), for each batch of produce.
- Liaise with the quality controller when problems with the sorting and grading arise.
- Report to the manager when the produce grade out percentage is lower than expected or the work is behind schedule.

| Self-Check – 9 | Written test |
|---|---|

Name…… ID…… Date…….

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

**Test I: Short Answer Questions**

1. List the specifications spice and herbs may include? (3pts)

2. List the role of the supervisor during sorting and grading operation? (3pts)

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

1. Sorting and grading operation needs good supervision. (3pts)

2. Inclusion of sub-standard produce will upset the client and can result in reduced or cancelled orders for future sales. (3pts)

*Note:* Satisfactory rating - 12 points Unsatisfactory - below 12 points

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

**Answer sheet**

**Test I**

1._____

2. _____

**Test II**

1._____

2._____

## Operation Sheet 1- Sorting and grading of cinnamon

Objectives of this operation in your training program are to:

- Ensure that you practice and acquire the skills needed to prepare for implementation of sorting and grading of cinnamon.

Procedures to sort and grade spice and herbs

Step 1 Making a test cut

The peeler makes a cut and lifts the bark to test bark detachment. If there is any difficulty in peeling, the peeler rejects the shoots

Figure: 1.1. Making test cut of cinnamon

Step 2 Sticks are collected, tied, carried and removing knots

Figure: 1.2. Removing knots of cinnamon

Step 3 Scraping is the cleaning or removing the outer cocky tissue layer from the sticks.

Figure: 1.3. Scraping of cinnamon

Step 4 Rubbing the in cinnamon (processing which to detach the bark from the stick)

- Average diameter, length and weight are 15mm, 20.3 cm, 110gram respectively.

Figure: 1.4. Rubbing of cinnamon

Step 5 Peeling the bark

Figure: 1.5. Peeling of cinnamon bark

Step 6 Obtain Quills grade product of cinnamon

Figure: 1.6. Quilling grade of cinnamon

## Operation Sheet 2- Sorting and grading of garlic

Objectives of this operation in your training program are to:

- Ensure that you practice and acquire the skills needed to prepare for implementation of sorting and grading of spice and herbs.

Procedures to sort and grade garlic

Step 1 Discuss the sorting and grading task to be carried out with your instructor and identify the work requirements for the task

Step 2 Select the necessary materials, tools and equipment for the operations to be carried out

Step 3 Sort harvested garlic (manually) in accordance with the standards and target market indicated by your instructor

- Removing dirt and foreign substances, discarding damaged parts, unwanted plant part(s)
- Sieving, trimming, singeing (to remove hairs or rootlets);

Step 4 Grade garlic in different group or category based on size, variety, color and etc., in accordance with the standards and target market indicated by your Instructor

Step 5 Label the graded garlic

The information that is required on the label will depend on the target market and client requirements.

Step 6 Clean the tools used and the work area when you have finished the activity

| LAP TEST | 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 **6** hour. The project is expected from each student to do it.

**Task-1** Sort and grade cinnamon

**Task-2** Sort, grade and label garlic in accordance with the standards and target market indicated by your instructor

| LG #52 | LO #3- Shut down the sorting and grading process |
|---|---|

**Instruction sheet**

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

- Identifying the appropriate shutdown procedure
- Shutting down process according to workplace procedures
- Identifying and reporting maintenance according to workplace

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 the appropriate shutdown procedure
- Shut down process according to workplace procedures
- Identify and reporting maintenance according to workplace

**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”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

## Information Sheet 1- Identifying the appropriate shutdown procedure

### 1.1. Shut down of equipment/machine

Shut down is the act of closing equipment/ machine or stopping of equipment/a machine. Refer to your standard operating procedures for the correct way to operate each type of processing unit in your workplace. The standard operating procedures for each type of equipment must be adhered to when shutting a processing down.

The types of shutdowns used in a plant unit are:

- Scheduled shutdown
- Maintenance shutdown
- Emergency shutdown

#### 1.1.1. Scheduled shutdown

A scheduled shutdown is initiated by the operator during normal operation of the unit when, maintenance is required. The shutdown procedure will depend on the type of equipment and the process to be done. Some steps taken in a unit/process shutdown may include:

- Shutting off the feeds to stop processes and heat generation particularly if processes are produce heat
- Shutting off heating or cooling to the unit/ processing operation
- Shutting off sorting, grading and other mechanical operations
- Removing or flushing waste materials from the processing workplace

#### 1.1.2. Maintenance shutdown

When maintenance to the sorter and grader equipment is required, the equipment may need to be entered so that work can take place. The shutdown should be a scheduled or planned shut down as per standard operating procedures where equipment is:

- Isolated (process, mechanical and electrical)
- Cooled and depressurized
- Cleaned
- Electric tested on a continuous basis prior to and during entry.
- A planned unit/plant shutdown will prevent:

- ✓ plugging of lines or equipment
- ✓ possible damage to equipment
- ✓ Possible injury.

### 1.1.3. Emergency shutdown

An emergency shutdown is initiated in the event of a fire, instrument failure, power failure, unexpected hazard or total loss of the processes. Emergency shutdown procedures must be followed during a shutdown sequence. Where a shutdown will affect upstream or downstream process units, advanced warning must be given to the appropriate personnel to allow them to prepare for, and react to, the changing conditions.

| Self-Check – 1 | Written test |
|---|---|

Name…… ID…… Date…….

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

**Test I short answer**

1. List the three type of shutdowns used in equipment or machine?(3)

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

1. The shutdown procedure will depend on the type of equipment and the process to be done.(2pts)

2. Shout is the act of closing equipment/ machine. (2pts)

3. An emergency shutdown is initiated in the event of a fire, instrument failure, power failure, unexpected hazard or total loss of the processes. (2pts)

*Note:* Satisfactory rating - 9 points Unsatisfactory - below 9 points

Score = _____

Rating: _____

You can ask you teacher for the copy of the correct answers.

**Answer Sheet**

Name: _____ Date: _____

Test I

1. _____

Test II

1. _____
2. _____
3. _____

## Information Sheet 2- Shutting down process according to workplace procedures

### 2.1. Shut down the process

The sorting and grading operation in spice and herb raw material processing machine should be shut down after completion of work every day according to the standards and procedures of the industry. Cleaning and sanitizing steps are listed below:

- Remove heavy debris and dry clean processing equipment, if needed
- Pre-rinse the equipment with adequate quality water
- Clean remaining debris from floor
- Rinse floor and drains with adequate quality water using a low pressure hose
- Use dedicated brushes to scrub floor and drains with an effective cleaner, applying adequate quality water as needed
- Foam and scrub the equipment with an effective cleaner and scrub using dedicated brushes
- Thoroughly rinse the equipment, floors, and drains with adequate quality water using a low pressure hose
- Remove excess water from floors
- Sanitize (according to manufacturer directions) the equipment and floors

Work from top down for cleaning and sanitizing activities. Some equipment may need to be disassembled before cleaning and sanitizing followed by reassembly.

### Successful shut down process

At some point, most machines will have a scheduled outage. The time, money and effort devoted to planned shutdowns can be extreme. Scheduled outages may be plant wide, occur through different sections or be cold or running. Job plans for each asset is a prerequisite. They also decrease costs versus emergency repairs by three to seven times.

| 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 short answer**

1. List the importance of successful outage procedure of equipment or machine?(2)

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

1. Sorting and grading operation in spice and herb raw material processing machine should be shut down after completion.(2pts)

2. Scheduled outages may be plant wide, occur through different sections or be cold or running. (2pts)

*Note:* Satisfactory rating - 6 points Unsatisfactory - below 6 points

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

**Answer Sheet**

Name: _____ Date: _____

**Test I**

1. _____
   _____

**Test II**

1. _____
2. _____

**Information Sheet 3- Identifying and reporting maintenance according to workplace**

### 3.1. Identifying and reporting maintenance requirement

- Any activities which require maintenance should be identified properly and reported immediately as soon as possible.
- Maintenance procedures and other work-related documents should identify preconditions and precautions, provide clear instructions for work to be done, and be used to ensure that maintenance is performed in accordance with the maintenance strategy, policies and programs.
- The procedures should normally be prepared in cooperation with the designers, the suppliers of plant and equipment, and the personnel conducting activities for quality assurance and technical support.
- The benefits to be accrued from the implementation of a program of planned maintenance can be found in the efficient and economical operation of the plant and equipment and the utilization of resources (i.e. plant and equipment and manpower) while also maintaining a sound standard of safe working and environmental conditions for operators, other occupants and employees within the workplace.
- Maintenance systems vary, depending on the location of the plant and equipment and/or company policy.
- Systems can range from the complete maintenance of plant and equipment using all available methods to their replacement on failure.
- Planned maintenance is work having benefited from information issued by manufacturers and suppliers, the experience and knowledge of the service department staff, and reports and records from previous service visits.
- Preventive maintenance is work to be carried out at a specific frequency as indicated by potential failures or known reduction in efficiency of the plant and equipment, thereby avoiding failures or a decrease in performance.
- Scheduled maintenance is work based on known information, such as number of operations, hours run, etc., and can therefore be carried out at a predetermined time interval.

- Corrective maintenance is work carried out following the failure of the plant and equipment, and is so designed to return the component to its normal operating condition.
- Emergency maintenance is that work which is required to be performed without delay due to a failure of a component which, if not implemented, would lead to further failures or even permanent damage, resulting in the total loss of the plant and equipment. Plant and equipment in such a condition may also be dangerous to personnel.

| Self-Check – 3 | Written test |
|---|---|

Name…… ID…… Date…….

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

**Write true if the statement is correct and false if the statement is incorrect**

1. Any activities which require maintenance should be identified properly and reported immediately as soon as possible. (2pts)

2. Corrective maintenance is work carried out following the failure of the plant and equipment.(2pts)

3. Emergency maintenance is that work which is required to be performed without delay due to a failure of a component which. (2pts)

Note: Satisfactory rating - 6 points Unsatisfactory - below 6 points

You can ask you teacher for the copy of the correct answers.

Score = _____

Rating: _____

**Answer Sheet**

Name: _____ Date: _____

**Test I**

1. _____
2. _____
3. _____

## Reference Materials

**Book:**


1. Cantwell, Cantwell M. 2001. Properties and recommended commended conditions for long term storage of fresh fruits and vegetables.
2. Britain FAOstat. http://faostat.fao.org/faostat/servelet/Xteservlet3?Areas Immelman, D. 2006. Garlic farming.
3. Codex code of hygienic practice for spices and dried aromatic plants (CAC/RCP 42-1995).


**WEB ADDRESSES**


1. https://www.cinnamonzone.hk/cinnamon_for_weight_loss_a.html
2. http://www.agri.ruh.ac.lk/Departments/Engineering/cinnamon/processing.htm#top
3. https://www.lankacinnamon.com/cinnamon-grades/
4. www.garlicfarm.ca/garli production.htm
5. https://www.gettyimages.com/photos/ginger-isolated?mediatype=photography&phrase=ginger%20isolated&sort=mostpopular
6. http://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/food_technology/technology_of_spices_and_condiments/18.cardamom__grading_/et/2888_et_m18.pdf

## AKNOWLEDGEMENT

We would like to express our appreciation to the TVET instructors and experts of regional TVET bureau, TVET College, and Federal Technical and Vocational Education and Training Agency (FTVETA) who made the development of this learning module with required standards and quality possible.

We wish thanks and appreciation to the representatives of BEAR II UNESCO PROJECT who covers the financial expenses, scarifying their time and commitments to develop learning module.

| No | Name | Qualification | Educational background | Region | Phone Number | E-mail |
|---|---|---|---|---|---|---|
| 1 | Tesfaye Tekola | A | Agronomy | Benishangul | 0910550651 | tttekola@gmail.com |
| 2 | Kelemu Dessie | A | Horticulture | Amhara | 0921846332 | kelemudessie2013@gmail.com |
| 3 | Yared Mulugeta | A | Food Process & Preservation Technology | SNNPR | 0913256626 | yayaet84@gmail.com |
| 4 | Bogale Tesfaye | A | Food Security & Development Study | Addis Ababa | 0920308594 | bogalt19@gmail.com |

**The trainers who developed this learning guide**