



ASCI

Agriculture Skill Council of India

COMPENDIUM ON HARVEST & POST HARVEST MACHINE ASSISTANT TECHNICIAN

QP ID - AGR/Q1116
NSQF LEVEL - 2



Er. Suchismita Dwivedy
Dr. Anil Kumar Swain
Mr. Anshuman Samantaray

KRISHI VIGYAN KENDRA, NAYAGARH
ODISHA UNIVERSITY OF AGRICULTURE & TECHNOLOGY
BHUBANESWAR, ODISHA



ICAR- Agricultural Technology Application Research Institute,
Kolkata, Zone -V





**Directorate of Extension Education
Odisha University of Agriculture and Technology
Bhubaneswar**



**Prof. Prasannajit Mishra
Dean, Extension Education, OUAT**

MESSAGE

It is a pleasure to learn that, Krishi Vigyan Kendra, OUAT, Nayagarh is conducting a skill Development Training program on “Harvest and Post Harvest Machine Assistant Technician” under Agriculture Skill Council of India (ASCI) at KVK campus during 20th November to 18th January 2025.

This particular course intends, a person that helps to manage and operate machinery required to harvest crops in the field, as well as the subsequent processing and handling of those crops after they are harvested with aiming to minimize losses and optimize quality throughout the post-harvest process.

Such type of training program will help to provide a new dimension on harvest and post-harvest operation of different agricultural commodities in the district and will promote development of new entrepreneurs in the region. I strongly believe that; this training is very important and wish a grand success and hope the compendium will provide adequate information on major commodities of Nayagarh district.

I hope many effective deliberations during the training program will be helpful for the aspirants and will provide a great opportunity for learning experience and eye-opening exposure to all the participants from various agricultural sectors.

(Prof. Prasannajit Mishra)

Date: 03.02.2025
OUAT, Bhubaneswar



**Collector & District Magistrate
Nayagarh, Govt. of Odisha**



**Sri Akshay Sunil Agrawal, I.A.S
Collector & District Magistrate**

MESSAGE

Krishi Vigyan Kendra, OUAT, Nayagarh has undertaken an ambitious program focussing on Entrepreneurship Development through Skill training on “Harvest and Post Harvest Machine Assistant Technician” under Agriculture Skill Council of India (ASCI).

This training program will foster entrepreneurship, income generation and employment opportunities for participants and their communities. This program also encourages the participants to pursue their careers in agriculture sectors through mechanization in particular for strengthening the livelihood.

This particular course includes providing Hands-on training along with exposure visits to various processing units to establish and manage small scale agri-business, either individually or collectively and this compendium will provide a comprehensive summary on harvest and post-harvest operations of agricultural commodities in Nayagarh district.

I highly commend the Scientific team of KVK, Nayagarh for their efforts in bridging the gap between lab to land operations, ensuring effective knowledge transfer.

(Sri Akshay Sunil Agrawal)

Date: 05.02.2025
Nayagarh, Odisha



PREFACE

Agriculture Skill Council of India (ASCI) works towards capacity building by bridging gaps and upgrading skills of farmers, wage workers, self-employed & extension workers engaged in organized / unorganized segments of Agriculture & Allied Sectors. Among various job roles “Harvest and Post Harvest Machine Assistant Technician” is one of job roles in developing the skills of manpower in emerging areas of agriculture.

Proper time and method of harvesting are important to avoid yield losses in the field. Both early and late harvest is detrimental with respect to yield and quality. The importance of post-production operations is as important as pre-production operations. The utilization of certain crops in different ways as one component and storage and handling of the product as a second component. Certain crops are specially produced and consumed, which are not known or totally neglected by people. The harvested produce should be properly threshed, cleaned and graded. Appropriate method of drying and proper storage is very much necessary.

This particular compendium on Harvest and Post Harvest Machine Assistant Technician can solve problems attached to production and post production operations of agricultural commodities in Nayagarh district. The proper knowledge is very much necessary for right time harvest and minimizing losses due to poor post-harvest handling problems which can enable to achieve a better output.

The author presented the compendium entitled "Harvest and Post-Harvest Machine Assistant Technician" in a scientific and systematic manner to understand the fundamentals of harvest and post-harvest technology clearly and easily.

The dedication and tireless efforts of the Scientific Team has been pivotal to the success of this course. This publication stands as a reflection of hard work and serves as a crucial resource for the aspirants to gather technical knowledge on harvest and post-harvest operations of different agricultural commodities. This compendium is anticipated to be an invaluable resource for all stakeholders involved in agriculture sectors.



CONTENT

Message		
Preface		
1.	Introduction	- 2
2.	Rice	- 3
3.	Post Harvest Management of Rice	- 4-9
4.	Products of Rice Bran	- 9-11
5.	Dal Processing	- 11-15
6.	Sugarcane Processing	- 15-21
7.	Cashew Apple Products	- 22
8.	Millet Products	- 22 - 23
9.	Food Safety Regulations and Standards	- 23- 24
10.	Opportunities For Micro/Unorganized Enterprises	- 24
11.	Processing and Value addition of Fruits and Vegetables	- 25 - 34
12.	Millet Processing	- 35-42
13.	Epilogue	- 43
14.	Annexure	- 44-45



INTRODUCTION

OVERVIEW OF HARVEST AND POST HARVEST OPERATION

HARVESTING

It is the operation of cutting, picking, plucking and digging or a combination of these operations for removing the crop from under the ground or above the ground or removing the useful part or fruits from plants.

Harvesting action can be done by four ways:

- 1) Slicing action with a sharp tool.
- 2) Tearing action with a rough serrated edge
- 3) High velocity single element impact with sharp or dull edge.
- 4) Two elements' scissors type action.

Manual harvesting involves slicing and tearing action.

Harvesting can be done by:

- (i) Manually operated tool
- (ii) Animal drawn machine
- (iii) Mechanically operated machine.

There are a few related terms in connection with harvesting, which are as below:

Mower: It is a machine to cut herbage crops and leave them in swath.

Reaper: It is a machine to cut grain crops.

Reaper binder: It is a reaper, which cuts the crops and ties them into neat and uniform sheaves.

Swath: It is the material as left by the harvesting machine.

Sickle: It is a curved steel blade having a handgrip and used for harvesting by manually.

Windrow: It is a row of material formed by combining two or more swaths.

Wind rower: It is a machine to cut crops and deliver them in a uniform manner in a row.

Post harvest processing ensures effective utilisation of harvested produce and the quality of the end product, which ultimately tells upon the consumption and acceptance of the produce. It has been estimated that there is considerable loss in many of the agricultural products after harvest. This is either because the post harvest technology has not been developed to the desired extent or because of the special problems in the marketing of the produce.

THRESHING

Thresher is a machine to separate grains from the harvested crop and provide clean grain without much loss and damage.

During threshing, grain loss in terms of broken grain, un-threshed grain, blown grain, spilled grain etc. should be minimum.

Bureau of Indian Standards has specified that the total grain loss should not be more than 5 per cent, in which broken grain should be less than 2 per cent.

Mechanical threshers are widely accepted by the farmers.

A mechanical thresher consists of the following parts

- i. Feeding device (chute/tray/trough/hopper /conveyor)
- ii. Threshing cylinder (hammers/spikes/rasp-bars/wire-loops/syndicator)
- iii. Concave (woven-wire mesh/punched sheet/welded square bars)
- iv. Blower/aspirator
- v. Sieve-shaker/straw-walker.



RICE

Harvesting of Rice

- For paddy, harvesting refers to the cutting and gathering of panicles attached to the stalks.
- Harvesting at the right time and in the right way maximizes grain yield and minimizes grain losses and quality deterioration.
- Once the plants have reached full growth (approximately three months after planting) and the grains begin to ripen-the tops begin to droop and the stem yellows-the water is drained from the fields.
- As the fields dry, the grains ripen further and harvesting is commenced.

Stage of Harvest

- Many factors must be considered to obtain optimum rice harvest.
- The grain must be mature, high in quality and have proper moisture content.
- Field should be sufficiently dry to support harvesting and transport.
- Timely harvesting ensures good grain quality, high market value and improved consumer acceptance.
- The right stage for harvesting is when about 80% panicles have 80 % ripened spike lets and their upper portion is straw colored. The grain contains about 20% of moisture.
- Rice should be harvested when the grains on lower part of the panicle are in hard dough stage.
- Maturity may be hastened by 3-4 days by spraying 20 % NaCl a week before harvest to escape monsoon rains.

Harvesting Methods

- Depending on the size of the operation and the amount of mechanization, rice is either harvested by hand or machine. The different harvesting systems are as follows:
- **Manual harvesting**
Manual harvesting makes use of traditional threshing tools such as threshing racks, simple treadle threshers and animals for trampling or by hand using sharp knives or sickles. Gives 55-60 % grain recovery.
- **Manual harvesting and machine threshing**
Rice is manually threshed, then cleaned with a machine thresher.
- **Machine reaping and machine threshing**
A reaper cuts and lays the crop in a line. Threshing and cleaning can then be performed manually or by machine.
- **Combine harvesting**
The combine harvester combines all operations from paddy harvesting to rice extraction - cutting, handling, threshing and cleaning. Gives 50 % recovery.



Threshing

- Threshing is the process of beating paddy plants in order to separate the seeds or grains from the straw.
- To maintain the high quality of the harvested grains, it should be threshed immediately after harvesting.
- Avoid field drying and stacking for several days as it affects grain quality due to over drying. Stacked grains of high moisture content results in dis-coloration or yellowing.

Manual threshing

- The manual methods of threshing are treading by feet, flail method, and beating stalks against tubs, boards or racks.
- Threshing can be done by trampling using bullocks, rubbing with bare human feet (in hills) or lifting the bundles and striking them on the raised wooden platform.
- Pedal threshers are also used.
- Freshly threshed rice must be dried well in the sun.

Machine threshing

- Mechanical threshing removes rice grains from the rice plant, speeds up threshing (thus reducing losses), and reduces labor requirements.
- Power driven stationary threshers are also used.
- Freshly threshed rice must be dried well in the sun

POST HARVEST MANAGEMENT IN RICE

REASONS FOR POST HARVEST LOSS

1. Poor product coming into storage
2. Poor storage management
3. Poor quality paddy + poor milling techniques Present situation Approx. 25-50% of the total grain value (quantity + quality) is lost between harvest and consumption in developing countries.

DRYING

- It is the process of removal of excess moisture from the grains
- Once dried, the rice grain, now called rough rice, is ready for processing
- Proper drying results in increased storage life of the grains, prevention of deterioration in quality, reduction of biological respiration that leads to quality loss of grains, and optimum milling recovery
- Safe moisture level as Grain = 14% & as Seed = 12%

METHODS OF DRYING

- Sun drying
- Mechanical drying
- Chemical drying



Sun Drying

- It is a traditional method of drying the paddy grains. Sun drying is the most economical method of drying grains.
- Grains are spread on drying surfaces such as concrete pavement, mats, plastic sheets and even on fields to dry naturally.

Mechanical Drying

- Drying process means drying the grains by ventilating natural or heated air through the grain mass to get it evaporated the moisture from it.
- Mechanical dryers are more reliable since drying could be done anytime of the year.

Chemical Drying

- This drying method involves the spraying of common salt solution with specific gravity of 1.1 to 1.2 on the ears of the mature paddy crop
- This treatment reduces the moisture content from 29% to 14.5% after four days.

Parboiling

- It is a pre-milling hydrothermal treatment given to unhulled rice (rough rice) to improve its milling quality, nutritive value, cooking quality and storability
- The process is accomplished in three steps: soaking, steaming and drying
- Single boiling method involves soaking the unhulled rice in water at room temperature followed by open steaming for 20-30 minutes using iron kettles and then sun drying
- In double streaming method, the unhusked rice is first steamed to raise its temperature and then soaked in cold water for 24-36 hrs. After soaking, it is steamed second time for 20-30 minutes followed by sun drying.

Milling

- Milling is the process wherein the rice grain is transformed into a form suitable for human consumption, therefore, has to be done with utmost care to prevent breakage of the kernel and improve the recovery.
- Brown rice is milled further to create more visually appealing white rice.
- After harvesting and drying, the paddy is subjected to the primary milling operation which includes de-husking as well as the removal of bran layers (polishing) before it is consumed. In this process the rice which is obtained after milling is called raw rice.
- Another process through which rice is obtained after milling is called "Parboiling Rice." Nearly 60% of the total rice produced in India is subjected to parboiling.
- Rice milling losses may be qualitative or quantitative in nature. Quantitative or physical losses are manifested by low milling recovery while low head rice recovery or high percentage of broken kernel reflects the qualitative loss in rice grains.

**Milling involves several steps, including:**

- Pre-cleaning: Removing foreign materials like soil, weed seeds, and straw
- Dehusking: Removing the husk, which makes up about 20% of the paddy
- Paddy separation: Separating the paddy from the brown rice
- Whitening or polishing: Whitening or polishing the rice
- Separation of white rice: Separating the white rice
- Rice mixing: Mixing the rice
- Mist polishing: Mist polishing the rice
- Rice weighing: Weighing the rice

Methods of Milling

- Traditional Method Before the advent of mechanical milling, hand-pounding traditional method of rice milling was in practice. In fact, hand-pounding rice has got more nutritive value as compared to machine milling rice
- In hand-pounding, a variety of implements is used such as: Mortar and Pestle Dhenki Hand Stone (Chakki)

Mechanical Method

- With the introduction of mechanized mills, hand-pounding method has steadily decreased because it could not compete with machine mills.
- The conventional mills in use can be categorized into three main types:
Huller mills Sheller-Huller mills Sheller-Cone Polisher mills

Modern Rice Mills

- Milling of Paddy: Milling paddy is the process of turning unpolished rice into refined white rice for consumption.

Shelling and separation:

- Separation hulling for removal of husk from paddy, it is necessary to apply shearing action / friction to the grain surface Hulling of paddy is done to remove the husk from the paddy grain.
- Due to application of friction, there is some breakage of grain too.
- After hulling, the resultant mixture contains brown rice, husk, broken grain and some unhulled grain.
- To have brown rice, these constituents need to be separated.

Hulling

- Hulling of Paddy machines are known by different names such as hullers, huskers, dehuskers, shellers. Machines used in hulling paddy are under-runner disc huller, Engleberg huller, centrifugal sheller and the rubber roll sheller.
- The efficiency of a huller is defined as the percentage of grain hulled with minimum breakage.
- Efficiency of a huller depends upon the construction of machine, its precision, its maintenance, adjustment and its operation.



- Rice Huller is used to perform the shelling and/or whitening process using a specially chilled, hard cast iron cylinder rotating inside a hardened screen.
- The degree of milling is controlled by: a) the outlet slide, which regulates the residence time in the Machine b) the huller blade, which regulates the severity of the process and is adjustable to suit the variety and condition of the rice being milled, to keep breakage to a minimum.
- Under runner huller consists of two horizontal cast-iron discs, partly coated with abrasive layer. The bottom disc rotates and is vertically adjustable whereas the top disc remains fixed. The clearance between the two discs depends on the variety of paddy and the condition of the grain.
- Paddy is fed into the centre of the machine at controlled rate and dehusking is done by compression and friction while coming out of the periphery of the discs.

Under runner disc huller advantage capacity:

- It is higher than steel huller type.
- Percentage of cracked and broken grains produced is less than that produced by steel huller type. More power efficient than steel huller type.
- Easy to operate. Low operation cost.
- Machine is very durable.
- Hulling efficiency is nearly comparable to rubber roll huller.

Under runner disc huller disadvantage capacity:

- It is very heavy and requires a moderate size operating space.
- This process scratches the rice kernel. As the abrasive stone wears, sand and silicon dislodges and mixes with rice and bran.
- Machine capacity is less than the rubber roll sheller. Huller efficiency in this machine is 85% - 90 %.
- Does not work well with paddy of mixed varieties (different kernel dimensions)

Rubber roll huller

- It consists of two rubber rolls, one is fixed in position while other is adjustable to have desired clearance between the rolls.
- Both the rolls having same diameter (150- 250 mm) and same width (60-250 mm) but rotate in opposite directions at differential speeds.
- One roll moves about 25 percent faster than the other. The difference in peripheral speeds subjects the paddy grains falling between the rolls to a shearing action that strips off the husk.
- The hulling efficiency of this machine is better than other hulling machines

Husk Separation

- Rice huller is a mixture of brown rice, paddy, husk, broken, bran and dust. The bran and dust are usually separated through an oscillating sieve with fine perforations. Broken are separated through self- cleaning sieves. Husk separation is done using husk aspirators available in various designs.



- Paddy Separation: After separation of husk, dust, bran and small brokens, a mixture of brown rice and paddy is obtained. The paddy is separated from brown rice using paddy separator.
- There are 3 types of paddy separators namely: compartment type, tray type and screen type.
- However, the most commonly used paddy separator is compartment type.
- Compartment type separator

It consists of a number of compartments in one, two, three or four decks.

- The number of compartments depends upon capacity of rice mill and varies from 5 to 80.
- Up to 10 compartments single deck is used
- Up to 12-20 compartments, two decks are used
- Up to 51 compartments, 3 decks are used
- Up to 80 compartments 4 decks are used.

Rice Shifter: These sifters are used to separate broken rice from head rice.

Polishing

- Polishing is the process of removal of bran layer in brown rice.
- After harvesting and drying, the paddy is subjected to the primary milling operation which includes de-husking as well as the removal of bran layers (polishing) before it is consumed.
- The rice obtained after this process is called raw rice

Quality and Grading

- Quality of rice is not always easy to define as it depends on the consumer and the intended end use for the grain.
- Grain quality is not just dependent on the variety of rice, but quality also depends on the crop production environment, harvesting, processing and milling systems.

Characteristics Considered for Grading of Milled Rice

- Dead rice, brokens and brewers percentages
- Defectives
- Foreign matter
- Presence of paddy
- Whiteness
- Chalkiness
- Moisture content



OBJECTIVES OF STANDARDS AND GRADES

- To ensure only edible rice reaches the consumer.
- To improve post harvest practices so as to eliminate or reduce waste.
- To improve agronomic practices to increase farm yields.
- To improve processing practices for better milling recoveries and for market expansion.
- To protect consumers from price/quality manipulation.

Grades of Indian Rice

- Common variety: Short bold & long bold rice
- Fine variety: Medium slender rice
- Superfine variety: Long slender & short slender rice

STORAGE

Storage is the process of keeping grains, whether in bags or in bulk, in a storage structure designed to protect the stored product from inclement weather and pests for a short or long period of time to await processing or movement to other location.

Grains are stored for either of the following reasons:

- To provide uniform supply of food throughout the year, because grains are produced seasonally while consumption is fairly uniform throughout the year.
 - To provide reserve for contingencies such as flood, drought and other calamities.
 - To speculate on a good price either in domestic or in the export market.
- The grains are stored at three different levels, such as:
- Producer's Level
 - Trader's Level
 - Urban Organizational Storage Level
- The methods followed for storing the grains are:
- Storage in bags
 - Loose storage
- Storage in bags is convenient for short term storage, where grain is intended for very early onward movement.
 - For short term storage, no control measures against insects are needed.
 - In loose/bulk storage method, large quantity of grains can be stored in per unit volume of space and the infestation of insects/pests is lower.
 - The basic requirements of a good storage practice are: a healthy, clean, and uniformly dried grain, and a structure that will maintain a suitable environment that will prevent pests

PRODUCTS OF RICE BRAN: Bran WAX OIL RICE BRAN

- It is the hard outer layer of grain and consists of aleurone, pericarp, germ and a part of endosperm. When bran is removed from grains, the grains lose a portion of their nutritional value. Bran removal amounts to 4% to 9% weight of the paddy milled. Bran is characterized by its high fat and protein content along with vitamins, minerals and many other useful chemicals.



USE OF RICE BRAN

- Bran Edible grade oil Industrial grade crude oil Free fatty acid manufacture Plasticizers Tocopherol Rice bran wax

RICE PRODUCTS

Husk:

- Rice husk contains 38% cellulose and 32% lignin and fuel materials.
- Paddy husk contains silica so it is abundantly used as fuel for boilers and households.
- It is also used for bedding materials in the livestock and poultry industry, ash cement or component for making light weight cement blocks for partition walls, in tile industry, oil absorbent, washing powder, and mulch.

Bran:

- Commonly used as animal feed in most developing countries, either directly or mixed with other ingredients as done by commercial feed producers.
- Rice bran has a high percentage of oil, which can be extracted by solvents.
- Edible bran oil is used extensively in India. Bran is also used in food processing industry for making biscuits and speciality cookies.
- Spoiled bran can be used in compost and used as organic fertiliser.
- De-oiled bran can be safely used as animal feed. India also produces edible bran oil and plans to increase output over the next few years.

RICE BROKENS: Used in breakfast cereals, baby foods and for making several food items with rice flour base, such as noodles, rice cakes and rice delicacies. Rice brokens are an export item from large commercial rice mills

RICE PROCESSED PRODUCTS

VALUE ADDITION

1. Processed Products
2. Fermented Products based on rice
3. Extruded Products

Parched Rice

- It is prepared by throwing rice in sand heated to a high temperature in an iron or ud pan.
- On stirring rice become crackle and swell. Then the content of the pan are removed and sieved to separate the parched rice from sand.
- Parboiled rice is used for making such rice.

Expanded rice

- It is a traditional convenience food widely consumed in India.
- The paddy is soaked in water over night, drained and either steamed or dry roasted in sand for parboiling.
- The parboiled paddy is milled, salted and roasted in sand for expansion.

Puffed Rice

- This is the popular ready to eat snack product is obtained by puffing milled rice.



- The rice is gently heated without sand to reduce moisture slightly.
- Then mixed with salt solution and again roasted to prepare puffed rice

Flaked Rice

- Traditionally it is prepared from soaked paddy. After heat treatment and immediate flaking using a flaking machine. Flaked rice is thin and white, red in colour.

Quick Cooking rice

- It is made by steeping polished rice in water to moisture content of 35%, cooking under pressure and drying.

2. RICE - FERMENTED PRODUCTS

Idli

Idli is a small, white acid-leavened, and steamed cake made by bacterial fermentation of a thick batter made from rice and dehulled blackgram dal.

Dosa

Dosa is another fermented products made out from fermented batter of rice and pulse in the proportion ranging from 6:1 to 10:1

3. RICE EXTRUDED PRODUCTS

- Extrusion is a process that combines several unit operations including mixing, kneading, shearing, heating, cooling, shaping and forming.
- It involves compressing, and working raw material like Flours, starches, protein, salt, sugar and other minor ingredients to form a semi solid mass and it is allowed to pass through a restricted opening .
- Heat is applied by steam injection or indirectly through a heated barrel.
- The extrusion cooking is also called a high temperature short time(HTST) process.
- Rice based extruded products include sevai, idiappam, murukku (chakli) rice based vadagam etc.
- Rice based noodles and noodles from fermented rice flour are popular.

Murukku

Raw rice and black gram were ground in a mill separately and sieved through 80 BS sieve and used for the preparation of murukku instant mix.

DAL PROCESSING

Some post-harvest equipment used for dal includes:

Dal mill machine

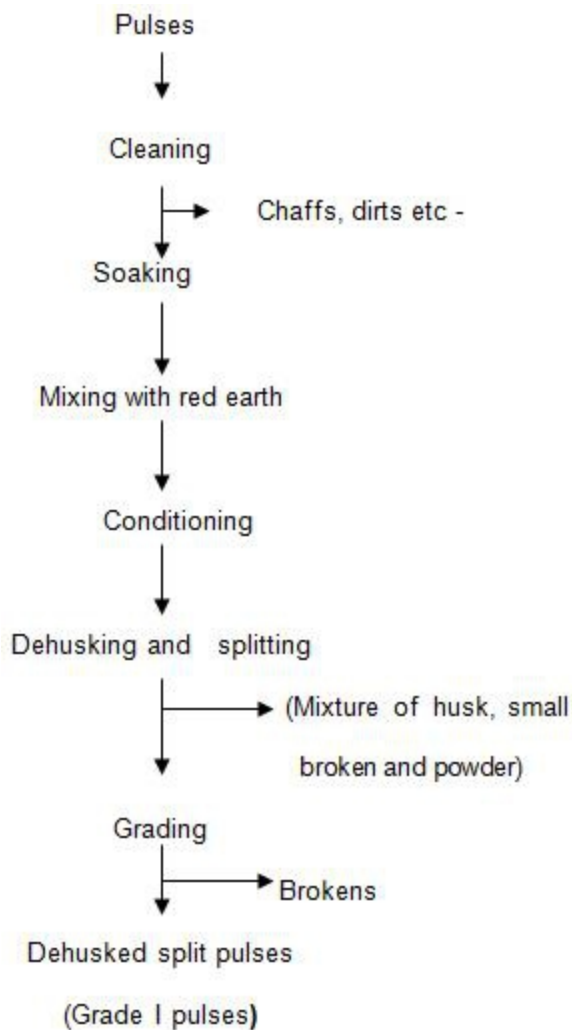
Removes the husk and splits pulses to improve their taste and digestibility.

Polishing equipment

Removes powder from dehusked splits and applies oil and water to give the dal a shine. This can be done with a cylindrical hard rubber roll, leather belts, emery cone polisher, or rollers with brushes.

Hand-operated pulse dehusking machine

It can dehusk and split pulses like pigeonpea, chickpea, soybean, and peas. It can dehusk 40–60 kg of pulses per hour.



Cleaning and grading

- Raw pulses need to be cleaned before milling.
- Normally rotary or reciprocating screen cleaners are used.
- Rotary screen graders are common in northern part of the country, whereas in the southern part, reciprocating screen graders are used.
- These graders separate the grains into different fractions based on size.
- Light impurities are removed with the help of blower or suction fans.
- Rotary screen cleaner/grader mainly consists of four compartments fitted with screens in sequence of increasing opening size.
- Smallest grains fall at the first compartment, whereas the largest one falls in the last column.
- Slope is given towards the direction of grain flow for ease of grain movement. Low RPM around 18–30, is maintained to ensure proper grading of raw material.
- Mild steel or wooden body is used to house these compartments depending upon choice of the customer.
- Reciprocating flat screen grader usually consists of three screens to separate the grain fractions.
- Blower is provided to remove dust, dirt and other fine impurities. Stroke length of 4-5 cm is provided for the reciprocating unit.



Dehusking

- Typically, carborundum/emery coated rollers are used for dehusking of different pulses.
- Cylindrical or taper rollers are used for the purpose.
- The foundation of taper rolls is kept horizontal whereas cylindrical rolls are mounted with inclination to the horizontal.
- This system facilitates ease of grain movement inside the drum. Normally, a slope of 15 cm for entire length of machine is recommended.
- Body of the roller is made of wood or steel on which mixture of carborundum/emery, chemical cement and salts are applied in layer of uniform thickness.
- The granule size of emery varies for crop to crop and type of operation to be performed on the grain.

Oil/Water applications

- This machine is used for mixing of oil/water to the pitted pulses. Screw conveyors with full flight or cut screw are used.
- The screw slowly moves the grain forward, with the oil/water application at the entry of the conveyor.
- The grain gets thoroughly mixed with oil/water while travelling the mixer length. Cut screw flights, commonly used in southern India, also serve the purpose of agitator and increases retention time for better mixing.

Drying

- Generally, sun drying on rooftop or in open drying yard is practiced. Since sun drying is a weather dependent process, the operation of the mill stops during rainy and cloudy seasons.
- To make conventional milling plants operational round the year, artificial or mechanical drying is essential.
- Accordingly, various manufacturers developed some batch or continuous dryers for use in dal mills. In order to avoid sun drying, CFTRI, Mysore has developed thermal treatment process using dryers.

Splitting

- To split the dehusked pulses and pulse seeds, roller mills, under runner disk made of medium size (24–30 No.) granules.
- Under disk runner machine consists of two horizontal disks with 1.25 cm emery coating. One of the disks is fixed whereas other one rotates.
- This rubbing action causes splitting of dehusked whole (i.e., Gota). It can also be used for splitting of black gram, chickpea, lentil, green gram and soybean.
- The capacity of the machine depends upon size and speed of the disk. Attrition mills are vertical or horizontal stone or emery disks.
- Some millers to minimize breakage during splitting use elevator and hard surface combination.
- Dehusked splits are dropped from a height of about 3-5 m on a hard surface to obtain splits. Impact splitter machine consists of mild steel blades mounted on shaft inside an enclosed casing.
- Rotating blades throw the 'gota' on stationary hard casing splits. The 'gota' is split by impact in the machine



Dal grading and Gota separation

- Gota separation from milled fractions is a big challenge.
- Whenever the grain is passed through emery roll, some part of grain is converted into dehusked whole called 'Gota'.
- It is difficult to separate dehusked whole grain from almost similar size whole grain using normal size grading machines.
- Gota' separating machine, based on surface properties was developed by CFTRI, Mysore.
- Combination of rotary and reciprocating screens are used in modern pulse milling plants to separate 'gota'.
- This machine is used for separation of 'gota' and whole grains, splits and broken.

Polishing

- Dal polishing denotes to removal of powder from dehusked splits and application of oil and water to impart shine and luster to the finished dal.
- Cylindrical hard rubber roll, leather belts or emery cone polisher is used for the purpose.
- Rollers mounted with brushes can also be used to impart shining to the dal.
- Powder particles are removed by rubbing action.
- Battery of screw conveyors with mild abrasive surfaces, like nylon rope or velvet cloth, can also be used for repeated rubbing.
- Accordingly, they are named as nylon or velvet polisher. Depending upon level of polishing 2, 3, 4 or 5 screw conveyors can be used.
- Oil and water polisher is similar to the oil/ water treating machine.
- Water or oil is applied at the entrance of the unit, worm inside the mixing unit acts as a polisher, often dal is required to be dried prior to final packaging.

Powder and husk separation

- Husk and powder are separated from dehusked pulses, using suction fan or blower.
- This unit may end into a cyclone separator and collected in bags, in order to reduce environmental hazard of fine dust in the plant premises.

Material handling

- Bucket elevators are widely used in dal mills for vertical grain movement. Usually drying of grains takes place on the roof.
- This saves time and energy lost in material handling. In large capacity plants, bucket elevators often control feeding inside the mill.

Post Harvest Processing:

Processing of pulses is of primary importance in improving their nutritive value. The processing methods used are soaking, germination decortications, cooking and fermentation.

- 1 Soaking:** Soaking in water is the first step in most methods of preparing pulses for consumption. As indicated above, soaking reduces the oligosaccharides of the raffinose family. Soaking also reduces the amount of phytic acid in pulses.



2. Germination: Germination improves the nutritive value of food pulses. The ascorbic acid content of pulses increases manifold after 48 hours germination. Germinated and sprouted pulses have been used to prevent and cure scurvy. The riboflavin, niacin, choline and biotin contents of all pulses increase during germination. The germination process reduces and/or eliminates most of the antinutritional and toxic factors in several pulses.
3. Decortication: A simple method is to soak the seeds for a short time in water; the husk takes up more water than the seeds and may be easily separated by rubbing while still moist. In the alternative, the soaked grains may be dried and the husk removed by pounding and winnowing. Roasting also renders the husk easier to separate. Roasted legumes like those of Bengal gram and peas are widely used in India.
4. Cooking: Cooking destroys the enzyme inhibitors and thus improve the nutritional quality of food pulses. Cooking also improves the palatability.
5. Fermentation: The processing of food pulses by fermentation increases their digestibility, palatability and nutritive value. Fermentation process improves the availability of essential amino acids and, thus, the nutritional quality of protein of the blend. In general, the nutritive value of the legume based fermented foods has been shown to be higher than their raw counterparts.
6. **Pulse milling :**
The removal of the outer husk and splitting the grain into two equal halves is known as milling of pulses.
 - A. Pulses are usually converted into Dhal by decutlating and splitting. Both dry and wet milling processes are employed. By and large carborundum emery rollers are used for dehusking and burr grinders for splitting. Decuticling is seldom complete in single pass requiring multiple passes, each pass producing 1.5 to 2% fines reducing recovery of dal.
 - B. Basic processes in dhal milling are cleaning, dehusking, splitting, separation and bagging. Major variation is involved with dehusking process only. Dhals like Aarahar, urad, moong and lentil are difficult to dehusk as a result repeated operations by dehusking rollers are required. Rewetting and drying is done to loosen portions of husk sticking after repeated rolling. Linseed oil is used to impart shine or better appeal to the milled dal.
 - C. To facilitate dehusking and splitting of pulses alternate wetting and drying method is used. In India trading milling methods produce dehusked split pulses. Loosening of husk by conditioning is insufficient in traditional methods. To obtain complete dehusking of the grains a large number of abrasive force is applied in this case as a result high losses occur in the form of brokens and powder. Yield of split & pulses in traditional mills are only 65 to 75% due to the above losses compared to 82 to 85% potential yield.

Dal Processing Unit for small scale industry

Sl. No	Machineries	Unit cost (Approx)(Rs)
1	Mini Dal Mill	60,000/-
2	Cleaner-Grader-polisher	30,000/-
3	Thresher-cum-Pearler	15,000/-
4	Threshing and pearling of minor millets	1500/-



SUGARCANE PROCESSING

Harvesting

In India harvesting of sugarcane is carried out at 10 to 18 months stage, depending upon the planting time and crop maturity. In sub-tropics, autumn crop is harvested at 15-month stage, whereas spring and summer (late-planted) crops at 10-12 months. Early varieties are harvested at 10 months stage, mid-late 10-12 months and late after 12-month stage. In tropical zone, crop is harvested after 16-18 months stage.

Manual Harvesting

Hand knives, cutting blade or hand axes are used for manual harvesting. It requires skilled labourers as improper harvest of cane leads to loss of cane and sugar yield, poor juice quality and problems in milling due to extraneous matter.

Sugarcane Stripper

- It is used to de-topping of leaf.
- Capacity-50kg/hr

Mechanical Harvesting

- Sugarcane is harvested by mechanical harvester which move along the rows of cane removing the leafy tops of the cane and cutting the stalk into short pieces or "billets". Billets are loaded into bins which are towed alongside the harvester.
- When full, the bins are taken by road or tramway to the sugar mill.
- The field capacity of mechanical cane harvesters varies with the size (2.5 to 4 ha per day of 8 hours).

PROCESSING OF JAGGERY

Selection of Sugarcane

Selection of good quality matured sugarcane having high sucrose content, high purity and low colloids is an important first step towards manufacturing quality jaggery.

Harvesting and cleaning of cane

Cane with brix more than 21 per cent should be harvested close to the ground and cleaned off dry leaves, trashes, green tops, roots and mud clods. Remove 2-3 immature internodes along with top portion. Soil adhering to the cane should be removed. The cleaned sugarcane should be immediately transported to the crushing yard and crushed within 24 hours of harvest. Delay in crushing may cause inversion losses.

Extraction of juice

For crushing of cane, horizontal power crusher able to extract 60 to 70% juice was used. Horizontal roller crushers yield 2-4% more juice compared to vertical roller crusher. At this process two products are obtained raw sugar cane juice as main product and bagasse. Level of extraction and concentration of soluble solids of sugar cane juice affects directly productivity. Percentage of extraction ($\text{Weight of juice} \times 100 / \text{Weight of cane}$) depends on operation conditions of crusher, which also has a significant effect on quality and quantity of sugar cane juice. Factor affecting extraction of juice are gap between rollers (6mm, crushing – 1mm extracting), size and speed of rollers, orientation of rollers, grooves on rollers (grip, preparation and juice drainage) and bearing and bushes.

Settling tank

The juice is then collected through underground PVC pipeline into the juice settling tank covered with thick layered cloth where small particle impurities are filtered from the juice. The juice is allowed to remain in the tank for one hour so that heavy impurities settles down due to gravity and the clean juice is then pumped into the specially designed open pans kept on furnace.

Juice filtration

The juice that comes out of crusher has some impurities, such as ions, colloid and dirt of soil, waste pulp and wax. Colloid are made up of soil, wax, fats, proteins, vitamins, glues, pectine, tannin and coloring material. Its percentage is low which ranges from 0.05 up to 0.3%. ionic and molecular dispersion correspond basically to sugars and minerals constituents. Hence the filtration of juice is essential to obtain jaggery free of soluble solids and impurities. The extracted juice is filtered with three layered wire mesh or thick cloth to separate undissolved impurities like trashes, pieces of bagasse, and roots etc. It is then passed through vibro or mechanical filters to get clear juice.



Juice Clarification

Clarification process eliminates solids in suspension, colloidal substances and coloring compounds by the accumulation of these impurities. Once pre-filtration process is finished sugar cane juice continues its progress to the first furnace at a temperature close to room temperature to be heated up to 50-55°C, which allows the formation of particles of higher density and larger sizes, which are easier to be removed. At this point, part of substances that generate, impurities to the finished product are still in suspension without being removed due to their sizes, unless, a clarification agent is added. The pre-heated juice is moved to a second furnace where a clarification agent is supplied to increase coagulation of impurities. Coagulation comprises of a series of chemical and physical reaction between the coagulant and the solution of sugar cane juice and as a result of this reaction the forces that keep together the particles are destabilized. Clarification of juice loaded in pans is very important for making light yellow coloured, crystallized and impurities free jaggery, which is edible and also suitable for storage. The dissolved impurities in the juice are removed with the help of herbal / vegetative clarificants. Phyto-clarificants are rich in gums & mucilage which are poly-glucuronic acid and act as a flocculent. These polymers dissociate on heating and form charged particles with large number of active sites to attract negatively charged impurities (colloidal, colouring & ash forming impurities). Some of these are mentioned below.

TABLE : 1 COMMONLY USED VEGETABLE

Sl No.	Name	Parts which are Used	Additional gm per quintal juice	Brief method of using
1.	Bhindi	Stem and roots	45-50	Dipped in water for about 2-4 hrs, pound and rubbed. Thus Mucilaginous liquid obtained is added
2.	Groundnut	Seed	70-75	Soaked, decorticated ground with water is mixed after straining

TABLE : 2

Chemical clarificants are also being used. Some of them are mentioned below.

Chemical & Quantity required per q juice	Action	Immediate effect on product	Remarks
Hydros (Sodium hydro sulphite) 3.5g	Colour bleaching	Brightens colour temporarily	Hastens colour darkening and process of spoilage within a month.
Lime (Calcium oxide) 100 to 125ml of 10% lime	Removes juice acidity. Helps in clarification	Liming to pH 6.3 to 6.6 results in good quality. Useful in solidification of jaggery from waterlogged, lodged canes. Excess liming results in hard jaggery.	Better storability of hard jaggery

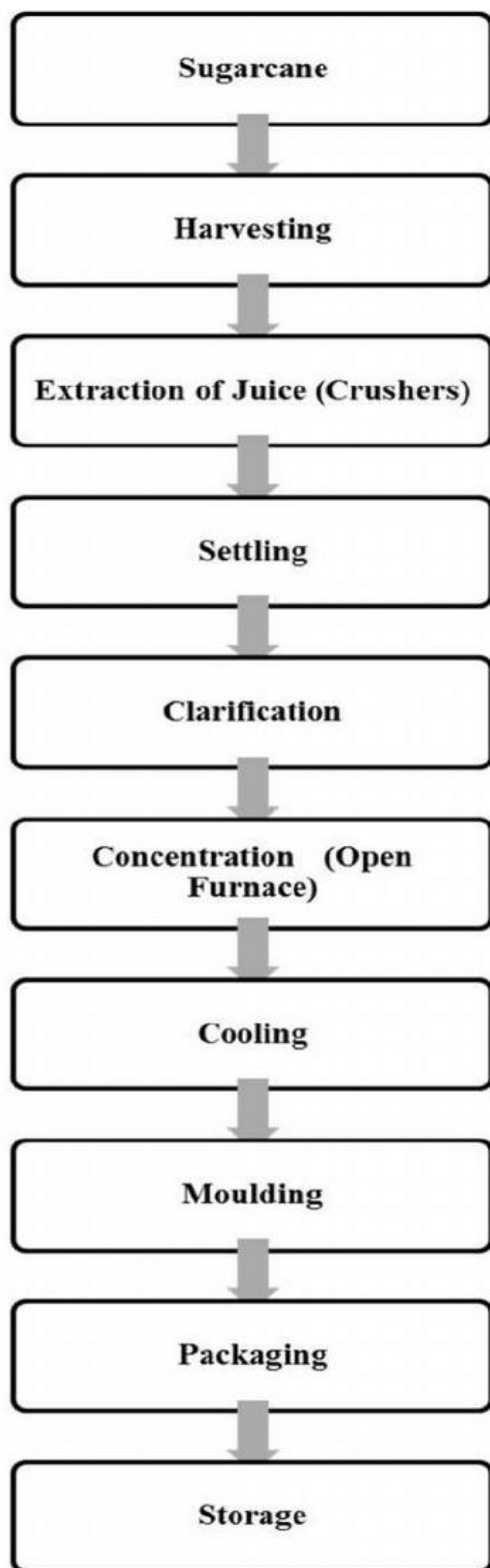


Fig. 1. Process flowchart for solid jaggery production



Fig. 2. Horizontal three roller crushers



Fig. 3. Juice Boiling in open pan



Fig. 4. Wooden moulds



Fig. 5. Solid Jaggery

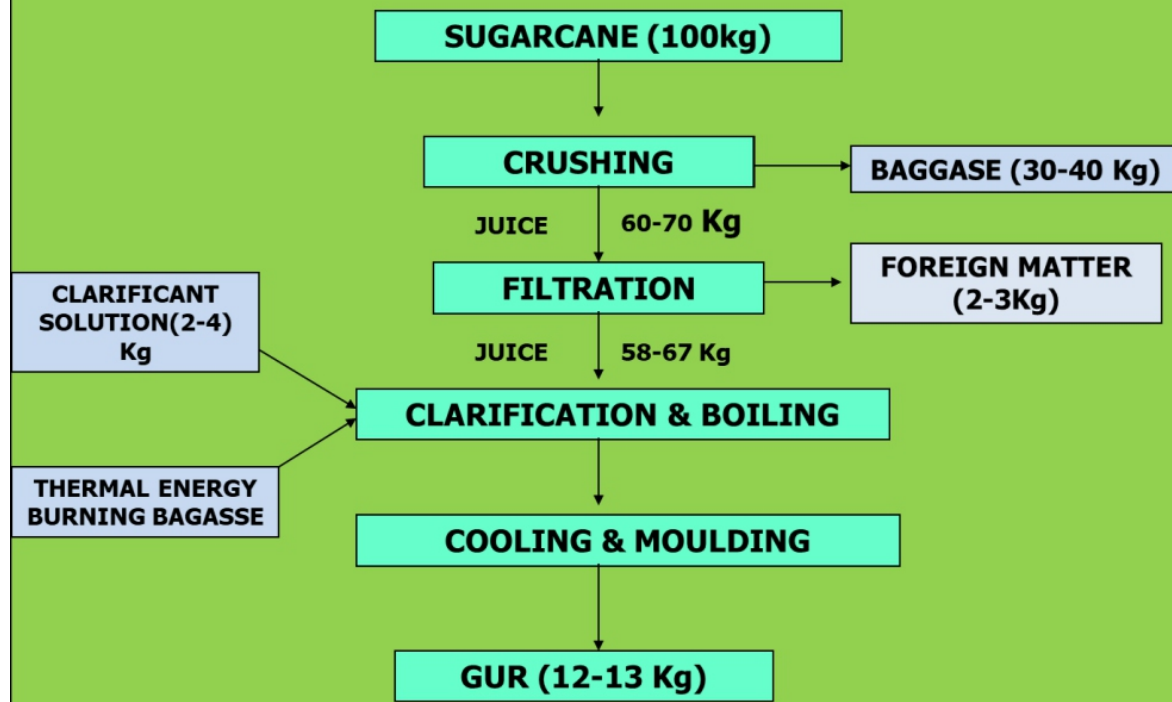


Proximate composition of sugar and jaggery (per 100 gm)

Constituent	Sugar	Jaggery
Sucrose, g	99.5	60-85
Reducing sugar, g	-	5 - 15
Protein, g	-	0.4
Fat, g	-	0.1
Calcium, mg	-	8.0
Iron, mg	-	11.4
Phosphorus,mg	-	4.0
Total minreals,g	0.05	0.6 – 1.0
Moisture, g	0.2 – 0.5	5-10
Energy, kcal	398	312 - 383

Gur also has 168mg carotene, 0.02 mg thiamine, 0.05mg riboflavin, 0.05 mg vitamin c

JAGGERY PROCESSING



**Concentration**

The juice is boiled till it reaches striking point temperature. (115oC – 118oC). Churning is done for uniform heating hence better product quality. It is then removed from the pan and kept in the wooden/ steel cooling pan. It is the final stage of the whole production process, it occurs at a temperature higher than boiling point of water. Inversion of sucrose depends on temperature, pH and the remaining time in the furnace. From 100°C inversion of sucrose speeds up significantly, due to this reason sugar cane juice should remain for the shortest time in the furnace and run a pH close to 5.8 to avoid an increment in reducing sugars.

Cooling and moulding

The juice concentrate is thoroughly mixed with the laddle. The slurry is, then poured into the moulding frames of desired shapes and sizes (2.5 cm cubical shape weighing 20-22 gm or 2.5 cm x 2.5 cm x 1.25 cm square shaped weighing 10-11 gm) developed by IISR, Lucknow.

MACHINERIES FOR JAGGERY PROCESSING

Power Operated Crushers

Juice recovery: 60-70%

Horizontal roller crusher: 2 - 4 %
better recovery

Capacity: 2-3 qtls /hr – 10 qtls/hr

Power needed: 5 hp - 16 hp

Equipments for Sugarcane Jaggery Preparation for small scale industry

Sl. No	Machineries	Unit cost (Approx)(Rs)
1	Improved Four Roller Sugarcane Crusher	50,000/-
2	Modified Electronic Thermometer	4,000/-
3	Churner	7500/-
4	Modified Hardness Tester (Used for testing hardness of solid jaggery. It is useful in distinguishing the jaggery samples for storage, transport and various other purposes)	2,000/-
5	Juice Boiling Pan	1,00,000/- (250kg capacity)
6	Sugarcane Juice Collection and Settling Tank	50,000/-
7	Boiling Pan Tipping Mechanism	10,000/-
8	Jaggery Moulding Frame(cube shaped jiggery)	5,000/-
9	Rectangular Shaped Jaggery Moulding Frame	5,000/-
10	Drying-cum-Storage Bin	2,000/-
11	Furnace(Boiling and concentration of sugarcane juice)	20,000/-
12	Solar Dryer for Jaggery(Facilitates jaggery packaging and elongates its' shelf life.)	30,000/-

JAGGERY PACKAGING

The packaging material to be used must be carefully chosen, taking into account both practical and marketing specifications, in order to ensure the consistency of the spices during handling, transport, storage, and delivery. In general, the packaging specifications for spices are listed below:

- To protect the product from spillage and spoilage.
- To provide protection against atmospheric factors such as light, heat, humidity, and oxygen.
- The selected packaging materials should have high water vapour and oxygen barriers.
- The packaging material should have a high barrier property to prevent aroma/flavour losses and in gross of external odour.



- The volatile oil contained in the spice substance has a tendency to react with the packaging material's inner/contact layer, often leading to a greasy and sticky packet with the printed matter being smudged.
- Therefore, the wrapping material should be resistant to grease and oil and be compliant with the commodity.
- The packaging content should, in addition to the above practical specifications, have good machinability, printability and be readily available and disposable

SUGARCANE JUICE READY TO SERVE (RTS)

Process Of Preparation

Sugarcane Cleaning Soaking Washing Crushing Filtering Homogenization Bottling Pasteurization Cooling Storage

- **Cleaning:** Remove mud and other unwanted material from the sugarcane before juicing.
- **Milling:** Break the sugarcane's structure and extract the juice.
- **Clarification:** Remove impurities from the juice through coagulation, flocculation, and precipitation. The insoluble precipitate absorbs and drags the impurities from the juice.
- **Filtration:** Filter the juice to get a clear solution.
- **Preservation:** Add preservatives, additives, and Flavors to the juice. Pasteurization at 70°C for 10 minutes can increase the shelf life of sugarcane juice to up to 90 days if refrigerated.
- **Bottling:** Store the juice in bottles and cork them.

THE PACKAGE TYPES GENERALLY USED AS CONSUMER PACKS ARE:

- Glass bottles of various sizes and shapes with labels and provided with metal or plastic caps. The plastic caps have added inbuilt features of tamper evidence, dispensing, grinding, etc.
- Printed tin plate container with/without dispensing systems
- Printed tin plate container with/without dispensing systems
- Plastic containers with plugs and caps with dispensing and tamper evidence features
- Printed flexible pouches – pillow pouch, gusseted pouch, stand-up pouch.
- Lined cartons

Material Of Packaging

Some of the commonly used laminates are:

- Polyester/metallised polyester/LDPE
- BOPP/LDPE
- BOPP/metallised polyester/LDPE
- Polyester/Al foil/LDPE



Bag Filling Machine



Automatic FFS Machine



Packaging machinery

CASHEW APPLE PRODUCTS

Cashew apple juice

Freshly harvested cashew apples are washed in running water and ensured to be free from soil debris or microbial spoilage. The juice extraction can be achieved through juice extractor. 430mg/liter quantity of gelatin solution is added to the juice to precipitate tannin.

Cashew apple squash

The procedure for preparation of juice and squash is similar. But the consistency of squash can be achieved by adding more sugar and citric acid. Freshly harvested cashew apples are washed in running water and ensured to be free from soil debris or microbial spoilage. The juice extraction can be achieved through juice extractor. 430mg/liter quantity of gelatin solution is added to the juice to precipitate tannin and preservatives viz., 6 g of sodium benzoate and 100 g of citric acid will be added. The squash can be diluted with three times of water and serve.

CASHEW APPLE READY-TO-SERVE(RTS)

The required amount of water with sugar (200 g sugar / 1 L water) and citric acid (5g) are boiled with continuous stirring. Amount of 200 ml clarified cashew apple juice and 100 ml of any fruit juice are added after switching off the flame. The content is cooled and packed in bottle.

MILLET PRODUCTS

Finger millet also known as ragi in India is one of the important cereals occupies highest area under cultivation among the small millets. Finger millet is comparable to rice with regard to protein (6-8%) and fat (1-2%) and is superior to rice and wheat with respect to mineral and micronutrient contents. In order to develop the value-added food products based on ragi, that can able to enrich the nutritional value and also beneficial for good health is the current need for the wellbeing of the society. Krishi Vigyan Kendra, Nagargarh provide technology for preparation of Ragi Laddu, Ragi Malt, Ragi cookies and other delicious value- added products of Ragi.



S. N.	Name of Ragi product	Ingredient
1.	Multi-grain flour / Composite flour	Cleaned finger millet seed (30%) and cleaned wheat seed (70%)
2	Ragi Malt – Weaning food	Sprouted finger millet seed (70%) and sprouted green gram seed (15%) and chickpea sprouted seed (15%)
3	Ragi Laddoo	Flour of finger millets, Chickpea and wheat, Rawa of wheat, molasses/sugar, Ghee, Cardamom, Mawa, Dry nuts.
4	Ragi Cake	Flour of finger millets & wheat, milk powder, dry fruits, soda, vanilla essence, katri, baking soda, sugar
5	Ragi Cookies	Flour of finger millets & wheat, soda, salt, baking powder, clarified butter/ghee/oil
6	Ragi Sev	Flour of finger millets, gram & rice, chilli powder, salt, caraway, sesamum
7	Ragi Barfi	Flour of finger millets, rawa of wheat, sugar, dry nut, dry coconut, milk, clarified butter
8	Ragi Halwa	Flour of finger millets, pulse of moong bean and gram, cardamom, milk, dry nut, sugar, clarified butter
9	Ragi Noodle	Ragi flour - 70%, Wheat flour - 30%, Salt, Water

FOOD SAFETY REGULATIONS AND STANDARDS

INTRODUCTION

The Food Safety and Standards Authority of India (FSSAI) has been established under Food Safety and Standards, 2006 which consolidates various acts & orders that have hitherto handled food-related issues in various Departments. The FSSAI is responsible for setting standards for food so that there is one body to deal with and no confusion in the minds of consumers, traders, manufacturers, and investors. The Act aims to establish a single reference point for all matters relating to food safety and standards, by moving from multi-level, multi-departmental control to a single line of command.

FSSAI REGISTRATION & LICENSING PROCESS

According to Section 31(1) of Food Safety and Standards (FSS) Act, 2006, Every Food Business Operator (FBO) in the country is required to be licensed under the Food Safety & Standards Authority of India (FSSAI). As per FSS (Licensing & Registration) Regulations, 2011, Licenses and Registrations are granted to FBOs in a 3-tier system

- Registration - for petty FBOs with annual turnover less than Rs 12 lakhs
 - State license - for medium-scale food manufacturers, processor and transporters
 - Central License - for large-scale food manufacturers, processor and transporters
- FSSAI registration is done online on the FSSAI website through Food Safety Compliance System (FoSCoS)
- FoSCoS has replaced the Food Licensing and Registration System (FLRS).
 - Petty food business operators are required to obtain FSSAI Registration Certificate



- “Petty Food Manufacturer” means any food manufacturer, who manufactures or sells any article of food himself or a petty retailer, hawker, itinerant vendor or temporary stall holder (or) distributes foods including in any religious or social gathering except a caterer or
- Other food businesses including small scale or cottage or such other industries relating to food business or tiny food businesses with an annual turnover not exceeding Rs. 12 lakhs and/or whose production capacity of food (other than milk and milk products and meat and meat products) does not exceed 100 kg/ ltr per day. Any person or entity that does not classify as a petty food business operator is required to obtain an FSSAI license for operating a food business in India.

FSSAI License - two types - State FSSAI License and central FSSAI License

Based on the size and nature of the business, the licensing authority would change.

- Large food manufacturer/processors/transporters and importers of food products require central FSSAI license

Medium-sized food manufacturers, processor and transporters requires state FSSAI license.

- License period: 1 to 5 years as requested by the FBO.
- A higher fee for obtaining FSSAI license for more years.
- If a FBO has obtained the license for one or two years, renewal may be done, no later than 30 days prior to the expiry date of the license.

OPPORTUNITIES FOR MICRO/UNORGANIZED ENTERPRISES

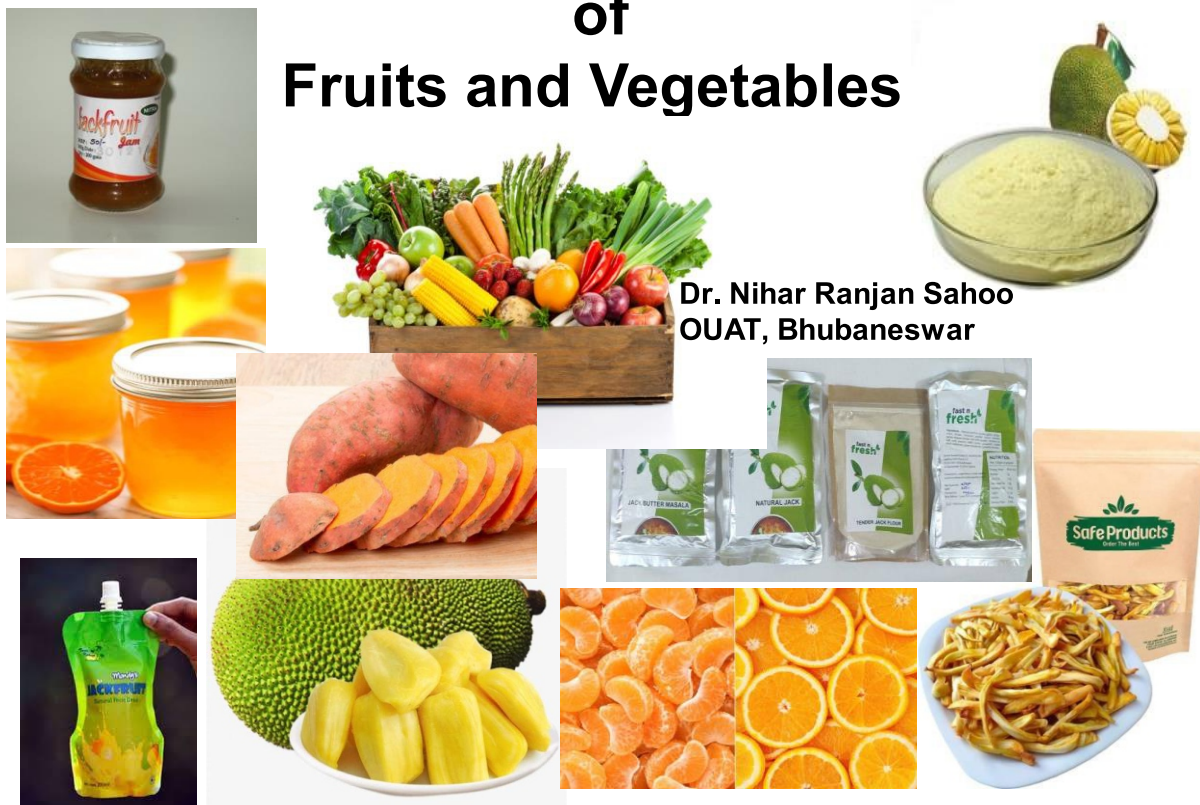
PM-FME Scheme:

Ministry of Food Processing Industries (MoFPI), in partnership with the States, has launched an all India centrally sponsored "PM Formalisation of Micro Food Processing Enterprises Scheme (PM FME Scheme)" for providing financial, technical and business support for up-gradation of existing micro food processing enterprises. The objectives of the scheme are:

- I. Support for capital investment for up-gradation and formalization with registration for GST, FSSAI hygiene standards and Udyog Aadhar;
- II. Capacity building through skill training, imparting technical knowledge on food safety, standards & hygiene and quality improvement;
- III. Hand holding support for preparation of DPR, availing bank loan and up-gradation;
- IV. Support to Farmer Producer Organizations (FPOs), Self Help Groups (SHGs), producers cooperatives for capital investment, common infrastructure and support branding and marketing.



Processing and Value addition of Fruits and Vegetables



SWEET POTATO PROCESSING AND USES





Sweet Potato Products





Sweet Potato Flour



Sweet Potato Noodles



Sweet Potato Chips



Value Additions in Jackfruit

Σ Jackfruit, one of the **underutilized fruit**, has got the **immense potential** for value addition.

Σ A **wide variety of items** can be prepared from jackfruit right from **immature stage to well-ripened stage**.

Σ Each item has its own qualities in terms of taste, preference, shelf-life, etc.

Σ Because of its **heaviness and large** size, **transportation and packaging are huge problems** to the successful marketing of jackfruit.

Σ Therefore, **value-added** products have more relevance for the **commercial utility rather than the whole fruit**.

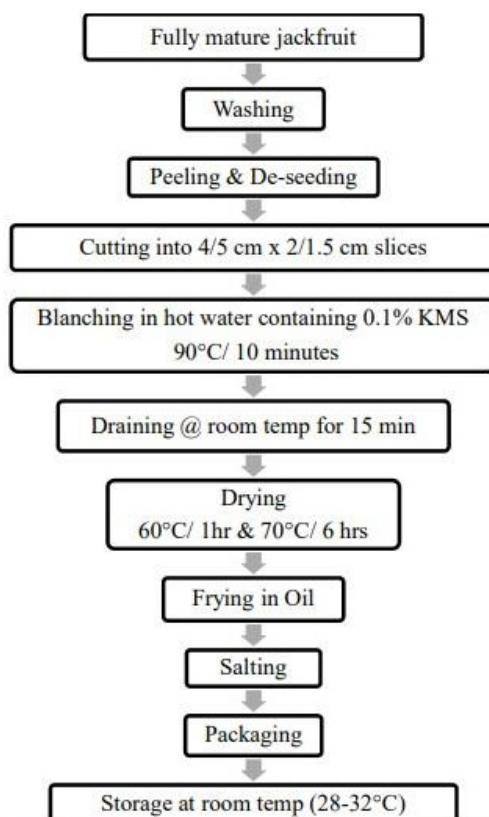
Σ Jackfruit can be preserved by applying various techniques like drying, freezing, canning, or by **converting** it into various products.



β Vacuum frying can be done with both **matured and ripe jackfruit** to produce a **bright yellow and crunchy product**.

β **Oil retains its properties** without change since low temperature and pressure are involved in the process thus the oil can be reused many times for vacuum frying through this technique.

β Nearly **90 % of oil use could be reduced** compared to convention frying, making it a healthy alternative to conventional frying.



Jackfruit flour

- The flour prepared by milling dried jackfruit bulbs extends the shelf life of jackfruit.
- Flour from matured bulbs has a yellowish-white colour.
- This can be used as an ingredient in many of the dishes like idly, chapati, upma, pappad, etc.
- Jackfruit flour, as it is diabetic-friendly and gluten-free, can be used along with wheat flour for making soft chapattis and as a fortifier in every dish.
- Moreover, the nutritious fiber content in this flour can have several health benefits.



Jackfruit Seed Powder

- Jackfruit seeds are rich in nutrients and can be a supplement for wheat flour to some extent.
- Replacement of the wheat flour with jackfruit seed flour will give gluten-free products option.
- Jackfruit seed powder is used to prepare cookies along with wheat, rice bran which gives better acceptability and healthy.
- It can be fortified with flours of ragi, maize, rice, and banana and used for the preparation of pasta.



Ready to cook (R-T-C) mature jackfruit

- Mature jackfruit bulbs can be stored for a long time by the drying method.
- The packed RTC jackfruit extends the shelf life of jackfruit.
- It can be rehydrated and used for the preparation of dishes in offseason too.
- RTC jackfruit also gives additional income to farmers and processors.



Retorted Tender Jackfruit (Technology for tender jackfruit in cans/retort pouches)

- Processing of tender jackfruit as a vegetable can give a quality product that fetches **better price in the market** and thus help to improve the financial status of the jackfruit growers in the state.
- Processed jackfruit products have an excellent market on the **domestic and export front**.
- The tender jackfruit from both 'varikka' and 'koozha' varieties were **minimally processed and canned**.
- The tender jackfruit is cleaned and cut into pieces, blanched, and sealed in cans/retort pouches along with preservatives.
- These are subjected to **retort processing**.
The retort processed tender jackfruit is **shelf-stable for one year** without any changes in its nutritive value.
The canned tender jackfruit **resembles fresh jackfruit** and is made available to the consumers in **ready-to-eat form throughout the year**.

This is a blooming technology in the food industry and a promising technology that is accepted by consumers.

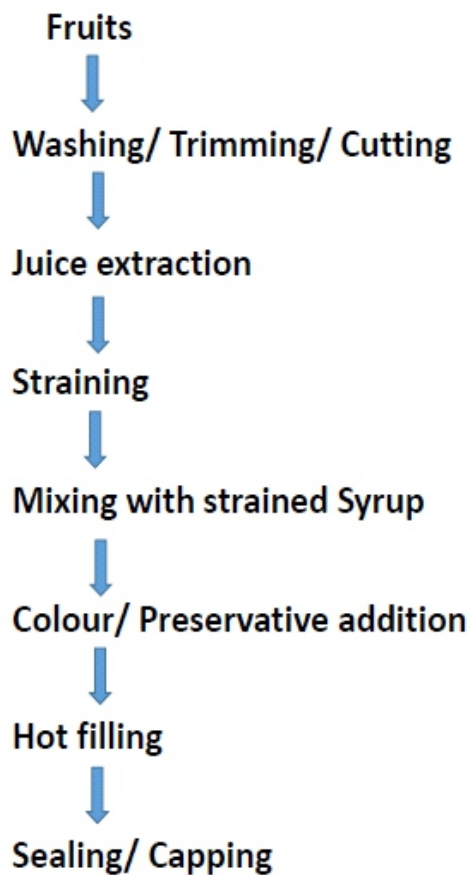


Osmo-dried jackfruit

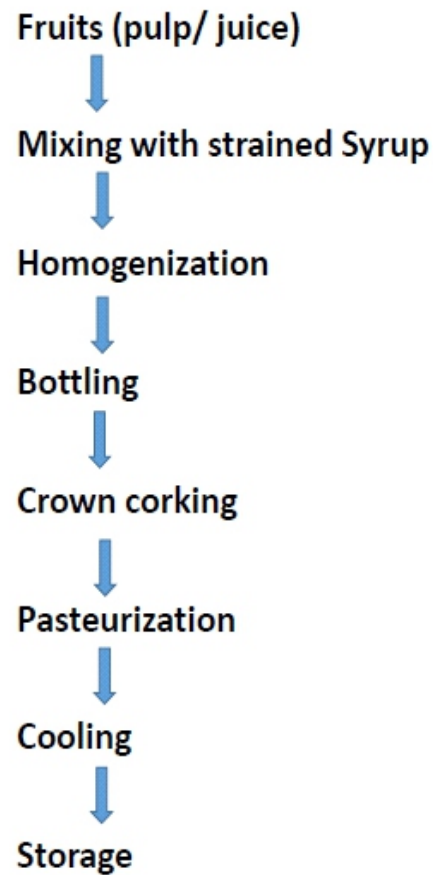
- This could be prepared by a **two-stage drying process** i.e. osmotic dehydration followed by any other secondary drying.
- Osmo-dried jackfruit is an intermediate moisture food product, and is not only delicious but also **conserves attractive colour and nutritional elements**.
- This processed product has a **six-month shelf life**.
- The ripe jackfruit bulbs are deseeded and soaked in sugar syrup for osmotic dehydration and further dried using a cabinet dryer.
- The **second stage of drying** done either by traditional drying, solar drying, cabinet drying.



Beverages



Fruit juice preparation

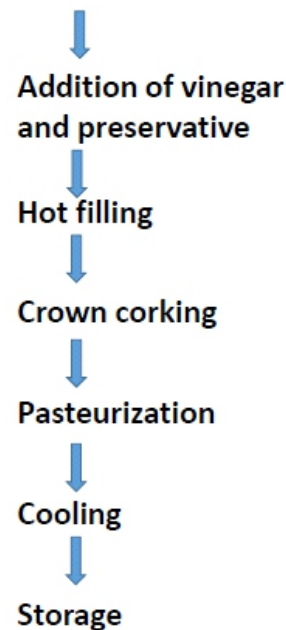
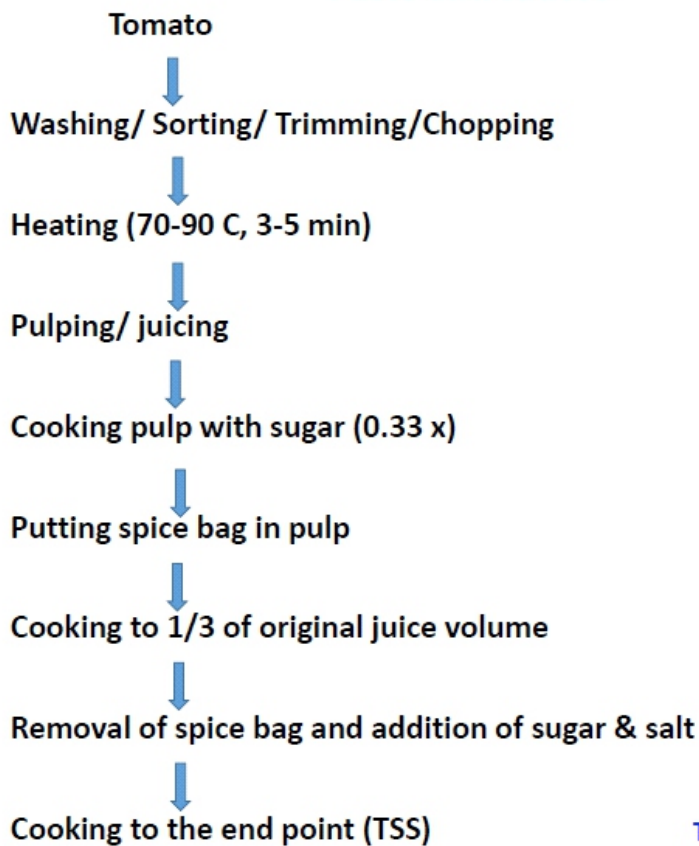


RTS preparation

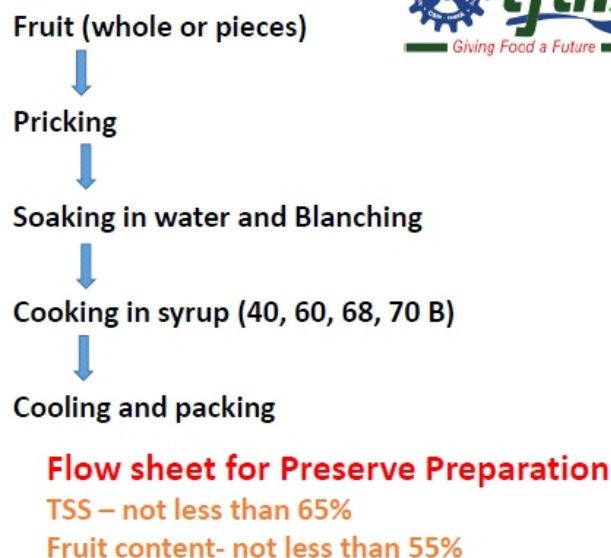
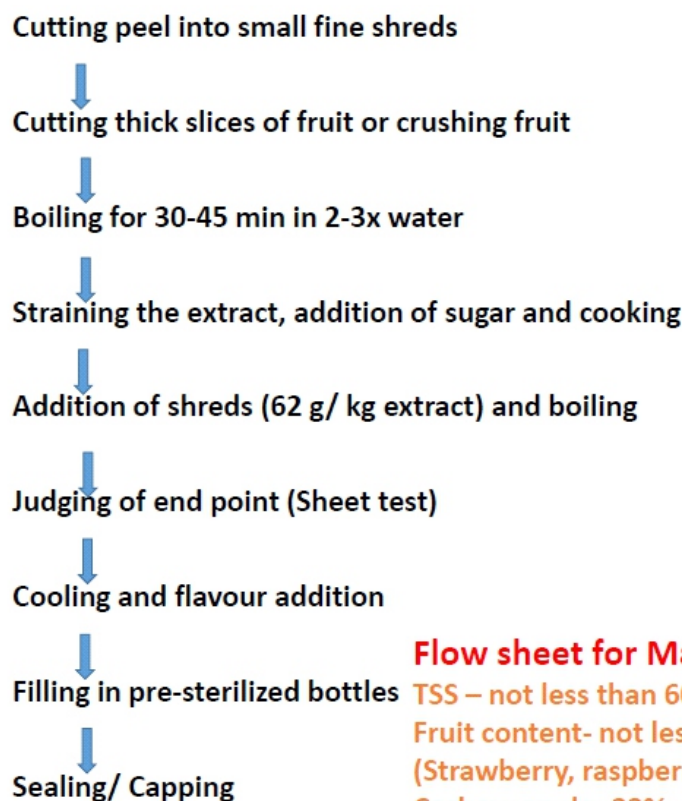
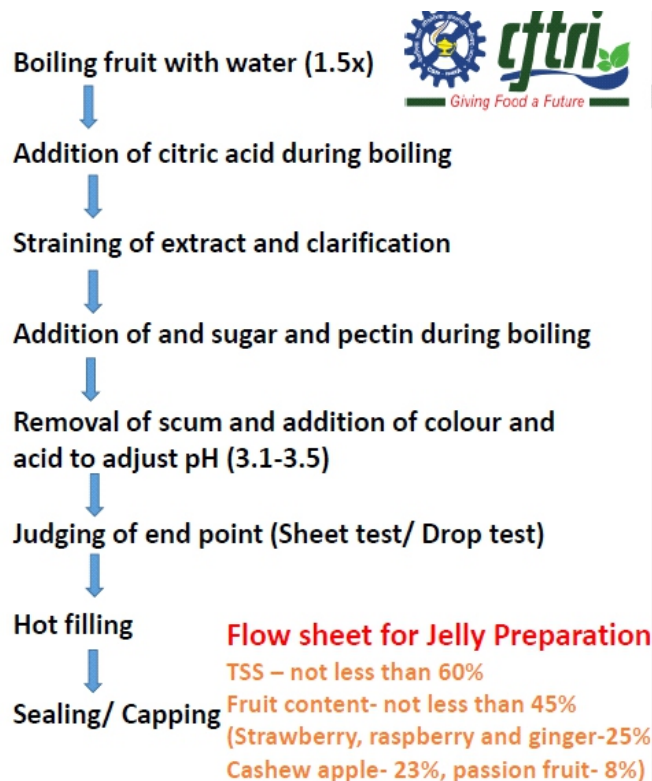
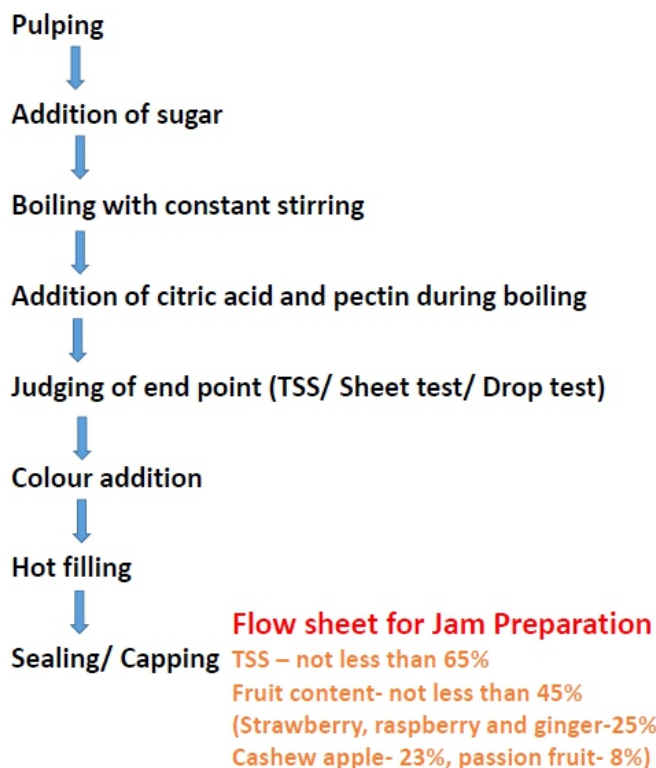


E 440 - Pectin
 E 332 – Potassium citrate
 E 224 - Potassium metabisulfite
 E202 - Potassium sorbate
 E122 - **synthetic red colorant** belonging to the group of azo dyes
 E127 - Erythrosine or Red Dye. It is a **cherry-pink/red synthetic coal tar dye**

Paste and sauces



Tomato Sauce/ ketchup preparation flow chart



Candied fruits



- The prepared fruit or peel is boiled in cane sugar syrup (30°B) containing 0.1% citric or tartaric acid for 10-15 minutes and then left in syrup for about 24 hours.
- Next day, the syrup concentration is raised to 40°B by adding more sugar.
- The whole mass is boiled for about 5 minutes and left for another 24 hours.
- The process is repeated until the syrup reaches 60°B.
- Syrup strength is progressively raised to 75°B at the rate of 5°B and boiling the mass on every alternate day.
- After syrup treatment, the fruits or the slices are removed from syrup and drained for about half an hour and sorted out to separate any defective and unwanted pieces.
- After this, the fruit/slices are dipped for a moment in boiling water to remove the adhering syrup followed by slow drying in the shade or in a drier at 66°C for 8 to 10 h.
 - Total sugar-not less than 70%
 - Reducing sugar- not less than 25% of total sugar

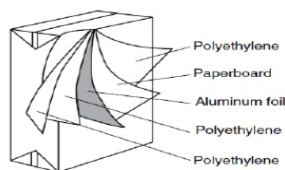


Packaging Materials Processed foods



Glass	• Chemically inert and will not affect quality, odor or taste of product. It is strong, rigid and 100% recyclable.		
PP/PET (polyethylene terephthalate)	• lightweight, flexible and recyclable. It can be used for both still and carbonated products.		
Metal Cans	• Aluminium, Tin and steel are mainly used. They are 100% recyclable and lightweight.		
Cartons	• They protect the freshness, flavors and nutritional qualities, enabling distribution at ambient temperatures or under refrigerated conditions		

Different Packaging Materials For Processed Products



(a) Layers of Brick Pack



(b) Juice in Brick Pack



(c) Nectar in Brick Pack



(d) Juice in Plastic Bottle



(e) Juice in Glass Bottle



(f) Beverage in Can





Millet Processing

ପୁଷ୍ଟିଶସ୍ୟର ପ୍ରକ୍ରିୟାକରଣ

ଯନ୍ତ୍ରପାତିର ରକ୍ଷଣାବେକ୍ଷଣ

Dr. U. S Pal

ଡ. ଉମା ଶଙ୍କର ପାଲ

ଗବେଷଣା ଯନ୍ତ୍ରୀ

ଅମଳ ପରବର୍ତ୍ତୀ ଯାନ୍ତ୍ରିକ ଓ ବୈଷୟିକ ଜ୍ଞାନ କୌଶଳ

ଭଲମାନର ଶସ୍ୟ ପାଇବା ପାଇଁ ନିମ୍ନଲିଖିତ କେତୋଟି ଦିଗ ପ୍ରତି ଦୃଷ୍ଟି ଦେବା ଉଚିତ୍

୧. ଅମଳ କେଣ୍ଡା ଗୁଡ଼ିକୁ ଜମିରେ ଶୁଖିବା ପାଇଁ ବେଶୀ ଦିନ ରଖନ୍ତୁ ନାହିଁ । ଶୁଖିଲା କେଣ୍ଡା ଗୁଡ଼ିକ ବେଶୀ ସମୟ ଭୂମି ସଂସ୍ପର୍ଶରେ ରଖିବା ଉଚିତ୍ ନୁହେଁ ।
୨. ଅମଳ ପରେ ଗୋଟିଏ ପରିଷ୍କାର ଚଟାଣରେ ଯଥାଶୀଘ୍ର କେଣ୍ଡାଗୁଡ଼ିକ ଥ୍ରେସିଂ କରିବା ଉଚିତ୍ ଓ ଶସ୍ୟ ଥ୍ରେସିଂ ପରେ ଶୀଘ୍ର ଶୁଖାଇବା ଉଚିତ୍ । ସାଧାରଣତଃ ଏହାକୁ ପ୍ଲାଷ୍ଟିକ୍ କିମ୍ବା ପାଲ ଉପରେ ଶୁଖାଇବା ଉଚିତ୍ ।
୩. ଖରାରେ ଶୁଖାଇବା ସମୟରେ ସମାନ ଭାବରେ ଶୁଖିବା ପାଇଁ ପ୍ରତି ଘଣ୍ଟାରେ ଥରେ ଘାଣ୍ଟନ୍ତୁ । ଖରା ସମୟରେ ଶସ୍ୟ ଅଧିକ ଗରମ ହେବାର ସମ୍ଭାବନା ଥିବାରୁ ଘୋଡ଼ାଇ ଦିଅନ୍ତୁ । ବର୍ଷା ଦାଉରୁ ମଧ୍ୟ ଶସ୍ୟକୁ ସୁରକ୍ଷିତ ରଖିବା ଉଚିତ୍ ।
୪. ଭଲ ଭାବରେ ଶୁଖିଯାଇଥିବା ଶସ୍ୟକୁ ପବନରେ ଉଡ଼ାଇ ସଫା କରାଯାଇଥାଏ ।
୫. ସଫା ଶସ୍ୟକୁ ବାୟୁରହିତ ପ୍ଲାଷ୍ଟିକ୍ ବ୍ୟାଗ୍ ବା ବନ୍ଦ ଡବାରେ ରଖି ଥଣ୍ଡା, ଶୁଖିଲା ଏବଂ ସଫା ସ୍ଥାନରେ ସଂରକ୍ଷଣ କରନ୍ତୁ ।
୬. ଶସ୍ୟ ସଂରକ୍ଷଣ ଗୃହକୁ ସଫାସୁତରା ରଖିବା ଉଚିତ୍ ଏବଂ ଏହାର କାନ୍ଥ କିମ୍ବା ଚଟାଣରେ ଫାଟ ନଥିବା ଦରକାର ଏବଂ ଆବଶ୍ୟକସ୍ଥଳେ ବିଶୋଧନ କରିବା ଉଚିତ୍ ।
୭. ସଂରକ୍ଷଣ ଗୃହକୁ ବାୟୁ ମଣ୍ଡଳର ଆର୍ଦ୍ରତା, ପକ୍ଷୀ ଓ ମୂଷା ଆଦିରୁ ରକ୍ଷା କରିବା ନିମିତ୍ତ ବିହିତ ପଦକ୍ଷେପ ନେବା ।

ପୁଷ୍ଟିଶସ୍ୟର ପ୍ରାଥମିକ ପ୍ରକ୍ରିୟାକରଣ

ପୁଷ୍ଟିଶସ୍ୟ ଗୁଡ଼ିକ ଅମଳ ପରେ ୧୦-୧୨% ଜଳୀୟ ଅଂଶ ପର୍ଯ୍ୟନ୍ତ ଭଲ ଭାବରେ ଶୁଖାଇ ଠିକ୍ ଭାବରେ ସଂରକ୍ଷିତ କରାଗଲେ ଏହା ବର୍ଷରୁ ଅଧିକଦିନ ରହିପାରେ । ତେବେ ଏଗୁଡ଼ିକ ଚୋପା ଲାଗିଥିବା ଅବସ୍ଥାରେ ସଂରକ୍ଷିତ କରିବା ଉଚିତ୍ ।

ପୁଷ୍ଟିଶସ୍ୟର ପ୍ରକ୍ରିୟାକରଣ ପର୍ଯ୍ୟାୟ ଗୁଡ଼ିକ ହେଲା ସଫା କରିବା, ଦାନାର ଆକାର ଅନୁଯାୟୀ ବର୍ଗୀକରଣ କରିବା, ଗୋଡ଼ି ଓ ଓଜନିଆ ପଦାର୍ଥ ବାହାର କରିବା, ଚଷୁ ବା ଚୋପା ବାହାର କରିବା ଇତ୍ୟାଦି । ଚୋପାଛଡ଼ା ପୁଷ୍ଟିଶସ୍ୟକୁ ଗୁଣ୍ଡ କରି କିମ୍ବା ଛୋଟ ଛୋଟ ଶସ୍ୟ ଖଣ୍ଡ ଆକାରରେ ପେଷାଯାଇ ରୋଷେଇ ଉପଯୋଗୀ କରାଯାଇଥାଏ ।



ପୁଷ୍ଟିଶସ୍ୟରେ ସମାନ ଆକାର ବିଶିଷ୍ଟ ଗୋଡ଼ି କିମ୍ବା ଓଜନିଆ ପଦାର୍ଥ ଥିଲେ, ତାହା ଗୋଡ଼ି ବାହାର କରିବା ଯନ୍ତ୍ରରେ ଆକାର ଭିତ୍ତିରେ ପୃଥକ କରାଯାଇଥାଏ । ପୃଥକ ହୋଇଥିବା ଶସ୍ୟକୁ ଗୋଡ଼ି ବାହାର କରିବା ଯନ୍ତ୍ରରେ ପକାଯାଇଥାଏ । ଏଥିରେ ଥିବା ନୂଆଁଶିଆ ଜାଲି ତଳୁ ଆସୁଥିବା ପବନର ପରିମାଣ ନିୟନ୍ତ୍ରଣ କରି, ସେଥିରୁ ଗୋଡ଼ି ବାହାର କରାଯାଇଥାଏ । ନୂଆଁଶିଆ ଜାଲି ଉପରେ ଗୋଡ଼ି ଓ ଶସ୍ୟ ସାନ୍ତୁତା ଭିତ୍ତିରେ ଦୁଇ ସ୍ତର ହୋଇଥାଏ । ଗୋଡ଼ି ଜାଲି ସଂସ୍ପର୍ଶରେ ଉପରକୁ ଉଠିଯାଏ ଏବଂ ହାଲୁକା ଶସ୍ୟ ତଳକୁ ଆସିଥାଏ । ଶୋଷକ ଓ ଶ୍ରେଣୀକରଣ ଯନ୍ତ୍ର ସହ ସଂଯୁକ୍ତ ହୋଇ ଗୋଡ଼ି ବାହାର କରିବା ଯନ୍ତ୍ର ବଜାରରେ ମଧ୍ୟ ଉପଲବ୍ଧ ହେଉଛି ।

ଝେପା ବା ଚଷ୍ମା ଛତାଇବା

ମାଣ୍ଡିଆ ବ୍ୟତୀତ ଅନ୍ୟ ପୁଷ୍ଟି ଶସ୍ୟ ବାହାରେ ଥିବା ଖାଇବା ଅନୁପଯୋଗୀ ଚଷ୍ମା ପ୍ରଥମେ ବାହାର କରାଯାଇଥାଏ । ଏଗୁଡ଼ିକ ଛୋଟ ଦାନା ବିଶିଷ୍ଟ ହୋଇଥିବାରୁ, ଏଥିରୁ ଝେପା ଛତାଇବା ଅପେକ୍ଷାକୃତ କଷ୍ଟକର । ହସ୍ତ କିମ୍ବା ମୋଟର ଚାଳିତ ପଥର ଚକି କିମ୍ବା କୁଟିବା ଯନ୍ତ୍ରରେ ଝେପା ବା ଚଷ୍ମା ପାରମ୍ପରିକ ଭାବରେ ବାହାର କରାଯାଇଥାଏ । ଝେପା ଛତା ଯନ୍ତ୍ର (dehuller) ମୁଖ୍ୟତଃ ଏମ୍ବରା ରୋଲର୍, ରବର ରୋଲ ମିଲ୍ କିମ୍ବା ସେଣ୍ଟିଫ୍ୟୁଗାଲ ପ୍ରକାରର ଉପଲବ୍ଧ ଅଟେ । ସେଣ୍ଟିଫ୍ୟୁଗାଲ ମିଲରେ ଶସ୍ୟ କମ୍ ଭାଙ୍ଗିଥାଏ ଏବଂ କମ୍ ଶକ୍ତି ଖର୍ଚ୍ଚ ହୋଇଥାଏ । ଏଥିରେ ଅଳ୍ପ ପରିମାଣ ଶସ୍ୟରୁ ମଧ୍ୟ ଝେପା ଛତାଯାଇପାରେ ଏବଂ ଏହାର ରକ୍ଷଣା ବେକ୍ଷଣା ଖର୍ଚ୍ଚ କମ୍ ହେଉଥିବାରୁ, ଆଜିକାଲି ଏହି ଯନ୍ତ୍ର ପ୍ରାୟ ବ୍ୟବହାର ହେଉଛି ।

ଶସ୍ୟରୁ ପ୍ରଥମେ ହାଲୁକା ଓ ଅପକ୍ୱ ଶସ୍ୟକୁ ପୃଥକ କରିବାପରେ, ଏହି ଯନ୍ତ୍ରରେ ଝେପା ଛତାଇବା ଉଚିତ୍ । ଝେପା ଛତା ଶସ୍ୟରୁ ଭଲମାନର ଦାନା ପାଇଁ ପୁଣି ଚକି ପୃଥକୀକରଣ ଯନ୍ତ୍ର ଏବଂ ରଜ୍ଜଭିତ୍ତିକ ପୃଥକୀକରଣ ଯନ୍ତ୍ର ବ୍ୟବହାର କରାଯାଇପାରେ । ଝେପାଛତା ଶସ୍ୟକୁ ପ୍ଲାଷ୍ଟିକ ଜରିରେ ପ୍ୟାକିଂ ପରେ ଲେବଲିଂ କରି ବିକ୍ରିକରାଯାଏ । ଏହି ପୁଷ୍ଟିଶସ୍ୟ ଋତୁକ୍ରମରୁ ବିଭିନ୍ନ ଖାଦ୍ୟ ପଦାର୍ଥ ଯଥା ଚୁଡ଼ା, ଖଇ ଇତ୍ୟାଦି ପ୍ରସ୍ତୁତ କରାଯାଇପାରିବ ।

ମାଣ୍ଡିଆର ପ୍ରକ୍ରିୟାକରଣ

ମାଣ୍ଡିଆ ମୁଖ୍ୟତଃ ଗୁଣ୍ଡକରି ବ୍ୟବହାର କରାଯାଇଥାଏ । ସଫା ମାଣ୍ଡିଆକୁ ଗୋଟିଏ ଏମ୍ବରା ରୋଲର୍ ଯନ୍ତ୍ରରେ ସାମାନ୍ୟ ରଗଡ଼ି ପରିଷ୍କାର କରାଯାଇଥାଏ । ନଚେତ୍ ମାଣ୍ଡିଆକୁ ପାଣିରେ ଧୋଇ ଶୁଖାଇଦିଆଯାଏ । ଉକ୍ତ ସଫା ଓ ପରିଷ୍କାର ମାଣ୍ଡିଆକୁ ଗୁଣ୍ଡ କରିବା ଯନ୍ତ୍ରରେ ପେଷାଇ ମୋଟର ଚାଳିତ ଚକ୍ଷୁଣୀରେ ଚଳାଯାଇଥାଏ । ଉକ୍ତ ଗୁଣ୍ଡକୁ ପଲିଥିନ୍ ଜରିରେ ପ୍ୟାକିଂ କରି ବିକ୍ରି କରାଯାଏ । ବଡ଼ ମିଲରେ ମାଣ୍ଡିଆକୁ କ୍ରମାନ୍ୱୟରେ ଚାରି ପାଞ୍ଚଟି ରୋଲର୍ ମିଲରେ ପେଷାଇ ଏବଂ ଚଳାଇ କୁଣ୍ଡା ଓ ଭୃଣକୁ ଅଲଗା କରାଯାଏ । ଗୁଣ୍ଡ ମାଣ୍ଡିଆକୁ ଦାନା ଅନୁଯାୟୀ ପୃଥକ କରାଯାଏ । ପୃଷ୍ଟିକର ଅଟା ପାଇଁ ଗହମ ଅଟା ସହିତ ୨୦-୩୦% ମାଣ୍ଡିଆ ଅଟା ମିଶାଇ ଯୌଗିକ ଅଟା ପ୍ରସ୍ତୁତ କରି ମଧ୍ୟ ବଜାରରେ ବିକ୍ରି କରାଯାଇପାରିବ । ଏହା ମଧୁମେହ ରୋଗୀଙ୍କ ପାଇଁ ଉପାଦେୟ ଅଟେ ।



ମାଣ୍ଡିଆର ସଂରକ୍ଷଣ ଅବଧି

ଭଲଭାବରେ ଶୁଖୁଥିବା ଗୋଟା ମାଣ୍ଡିଆ ବର୍ଷାଧିକ କାଳ ରଖାଯାଇପାରେ । କିନ୍ତୁ ମାଣ୍ଡିଆ ଗୁଣକୁ ନିମ୍ନଲିଖିତ ପ୍ରକ୍ରିୟାକରଣ ପଦ୍ଧତି ଅବଲମ୍ବନ କଲେ ଛଅ ମାସ ପର୍ଯ୍ୟନ୍ତ ରଖାଯାଇପାରିବ ।

୧. ସଫା ଏବଂ ବିଶୋଧିତ ଶସ୍ୟକୁ ପେଷାଇବା ।
୨. ଗୋଟାଦାନାକୁ ସଫା କରିବା ପରେ ଘର୍ଷଣ ଜନିତ ରଗଡିବା ଯନ୍ତ୍ରରେ ଉପର ଟ୍ରେପାକୁ ଭଲଭାବରେ ଘସି ସଫା କରିବା ।
୩. ଶସ୍ୟରୁ ସବୁ ବାହ୍ୟ ଅବରକାରୀ ପଦାର୍ଥ ଭଲଭାବରେ ବାହାର କରିବା ।
୪. ସଫା କରିବା ଯନ୍ତ୍ର, ପେଷାଇବା କଳ, ଯନ୍ତ୍ର ଚଳିତ ଚଲୁଣି ଓ ହପର ଆଦିକୁ ନିୟମିତ ସଫା କରି ଭିତରେ ରହିଯାଇଥିବା ଶସ୍ୟକୁ ବାହାର କରିବା
୫. ଶସ୍ୟ ଅଖା ଓ ସଂରକ୍ଷଣ କୋଠାକୁ ବିଶୋଧିତ କରିବା
୬. ଗୁଣ୍ଡ ରଖାଯାଉଥିବା ଜାଗାକୁ ଭଲ ଭାବରେ ସଫା ସୁତରା ରଖିବା ।
୭. ଉପଯୁକ୍ତ ବ୍ୟାଗ୍ରେ ପ୍ୟାକିଂ କରି ଥଣ୍ଡା ଓ ଶୁଖିଲା ସ୍ଥାନରେ ସଂରକ୍ଷଣ କରିବା ।

ମାଣ୍ଡିଆକୁ ଭାଙ୍ଗିଲେ ସେଥିରେ ଥିବା ଅପୃଷ୍ଠି ତରୁ ନଷ୍ଟ ହୋଇଯାଏ, ଶ୍ୱେତସାରର ହଜମଶୀଳତା ବଢେ ଏବଂ ଏହାର ସ୍ୱାଦ, ରଙ୍ଗ ଓ ବାସ୍ନା ରୁଚିକର ହୁଏ । ଏହାର ଗୁଣକୁ ବିଭିନ୍ନ ପ୍ରକାର ଖାଦ୍ୟରେ ଓ ଛତୁଆରେ ବ୍ୟବହାର କରାଯାଇଥାଏ । ମାଣ୍ଡିଆରେ ୮ ରୁ ୧୦% ପାଣି ମିଶାଇ ୪ ରୁ ୬ ଘଣ୍ଟା ଛାଇରେ ରଖିବା ପରେ ବାଲିରେ ଭାଙ୍ଗି ମାଣ୍ଡିଆ ମୁଜି ମଧ୍ୟ ପ୍ରସ୍ତୁତ କରାଯାଇପାରିବ । ଏବେ ଗରମ ପବନ ଦ୍ୱାରା ମୁଜିଭଜା ଯନ୍ତ୍ର ମଧ୍ୟ ବାହାର କରାଯାଇଛି ।

ମାଣ୍ଡିଆ, ଗହମ, ରୁଟା, ବୁଟ, ବାଦାମ, ଆଦିକୁ ଭାଙ୍ଗି ସେଥିରେ କ୍ଷୀରଗୁଣ୍ଡ, ଚିନି ଓ ଭଜା କାକୁ ମିଶାଇ ଗୁଣ୍ଡକରି ସ୍ୱାଦିଷ୍ଟ ଛତୁଆ ପ୍ରସ୍ତୁତ କରାଯାଇଥାଏ । ଉକ୍ତ ଛତୁଆକୁ ଆଲୁମିନିୟମ ଯୁକ୍ତ ବହୁସ୍ତରୀୟ ପଲିଥିନ୍ ଜରିରେ ପ୍ୟାକିଂ ଏବଂ ଲେବଲିଂ କରି ବିକ୍ରି କରାଯାଇପାରିବ ।

ମାଣ୍ଡିଆରୁ ଶିଶୁ ଖାଦ୍ୟ ପ୍ରସ୍ତୁତି

ମାଣ୍ଡିଆକୁ ଗଜା କରି ମାଲୁ ପ୍ରସ୍ତୁତ କରାଯାଏ । ଏହାଦ୍ୱାରା ମାଣ୍ଡିଆର ପୁଷ୍ଟିତତ୍ତ୍ୱ ବୃଦ୍ଧି ହେବା ସହିତ ହଜମଶୀଳତା ମଧ୍ୟ ବଢିଥାଏ । ମାଣ୍ଡିଆକୁ ଧୋଇ ସଫା କରିବା ପରେ ପାଣିରେ ୧୨ ଘଣ୍ଟା ବତୁରାଯାଏ । ଏହାପରେ ମାଣ୍ଡିଆକୁ ପାଣିରୁ ଛାଣି ସାଧାରଣ ତାପମାତ୍ରାରେ ୪୮ ଘଣ୍ଟା କନାରେ ବାନ୍ଧି ଗଜା ହେବାକୁ ଦିଆଯାଏ । ଗଜା ମାଣ୍ଡିଆକୁ ଶୁଖାଇବା ଯନ୍ତ୍ରରେ ୫୦° ସେ.ଗ୍ରେ. ତାପମାତ୍ରାରେ ୨ ରୁ ୩ ଘଣ୍ଟା ଶୁଖାଇବାପରେ ଗଜା ଓ ଚେର ଅଂଶକୁ ରଗଡି ବାହାର କରିଦିଆଯାଏ ।

ଉକ୍ତ ମାଣ୍ଡିଆକୁ ୭୩° ସେ.ଗ୍ରେ. ତାପମାତ୍ରାରେ ଭାଙ୍ଗି ୫% ପାଣି ମିଶାଇ ଦିଆଯାଏ । ଗୁଣ୍ଡ କରିବା ଯନ୍ତ୍ରରେ ଏହାକୁ ପେଷାଇ ଚାଲୁଣୀରେ ଚଲାଇ ଖଦଡିଆ ଗୁଣ୍ଡକୁ ଅଲଗା କରିଦିଆଯାଏ । ଟିକ୍କଣ ଗୁଣ୍ଡକୁ ପଲିଥିନ୍ ପ୍ୟାକ୍ କିମ୍ବା ପେଟ୍ ପ୍ଲାଷ୍ଟିକ୍ ଡବାରେ ପ୍ୟାକିଂ କରି ବିକ୍ରି କରାଯାଇପାରିବ । ଏହାକୁ ଗରମ କ୍ଷୀରରେ ସ୍ୱାଦ ଅନୁଯାୟୀ ଚିନି ସହ ମିଶାଇ ବ୍ୟବହାର କରାଯାଏ ।



ମାଣିଆ ଗୁଣ୍ଡ ମିଶାଇ ପୁଷ୍ଟିକର ପାମ୍ପ, ଏକ୍ସଟେଣ୍ଡ ଖାଦ୍ୟ(କୁର୍କୁରେ ପରି), ନୁଡଲସ୍, ପାଣ୍ଡା, ବ୍ରେଡ୍, ବିସ୍କୁଟ, ବରା, ବାରମଜା, ଦୋସା, ସୁପ୍, ଇଡଲି, ପକୋଡା, ଏବଂ ଲଡୁ ଆଦି ପ୍ରସ୍ତୁତ କରାଯାଇପାରିବ । ମାଣିଆ ଗୁଣ୍ଡ ମିଶାଇବା ଦ୍ୱାରା ଉଚ୍ଚ ଖାଦ୍ୟ ଗୁଣ୍ଡିକର ଖାଦ୍ୟଗୁଣ ବଢିଯାଇଥାଏ । ଏହା ବ୍ୟତୀତ ପାରମ୍ପରିକ ମାଣିଆ ଜାଉ ଏଡିପିଲ ପ୍ଲାଷ୍ଟିକ ଡବାରେ ରଖି ତାପ ପ୍ରୟୋଗ ପୂର୍ବକ ପ୍ରକ୍ରିୟାକରଣ କରି ବଜାରରେ ମଧ୍ୟ ବିକ୍ରି କରାଯାଇପାରିବ ।

ଲଘୁଦାନା ଶସ୍ୟକୁ ବିଭିନ୍ନ ଅନୁପାତରେ ମିଶାଇ ରାନ୍ଧିବାକୁ ପ୍ରସ୍ତୁତ ଶୁଖିଲା ଖାଦ୍ୟ ଯଥା ଦୋସା, ଇଡଲି, ବରା, ଉପମା, ଗୁଣ୍ଡ ରୂପେ ମଧ୍ୟ ପ୍ୟାକିଂ କରି ବଜାରରେ ବିକ୍ରି କରାଯାଇପାରିବ । ଖାଇବାକୁ ପ୍ରସ୍ତୁତ ଉପମା ଓ ଖେଚୁଡି ଗୁଣ୍ଡ ମଧ୍ୟବିକ୍ରି କରାଯାଇପାରିବ, ଯାହା ଗରମ ପାଣିରେ ମିଶାଇ ସାଙ୍ଗେ ସାଙ୍ଗେ ବ୍ୟବହାର କରାଯାଇଥାଏ ।

ଘରୋଇ ସ୍ତରରେ ଗୋଟିଏ ଲଘୁଶସ୍ୟ ପ୍ରକ୍ରିୟାକରଣ ଶିଳ୍ପ ପ୍ରତିଷ୍ଠା ପାଇଁ ନିମ୍ନଲିଖିତ ଯନ୍ତ୍ରପାତିର ଆବଶ୍ୟକତା ରହିଛି ।

୧. ସଫା ଓ ବର୍ଗୀକରଣ କରିବା ଯନ୍ତ୍ର(cleaner-cum-grader)
୨. ଗୋଡିବାଛିବା ଯନ୍ତ୍ର
୩. ଚୋପା ବା ଚଷ୍ମା ବାହାର କରିବା ଯନ୍ତ୍ର
୪. ଚିକ୍କଣ ବା ପଲିସ୍ କରିବା ଯନ୍ତ୍ର
୫. ଶୁଖାଇବା ଯନ୍ତ୍ର
୬. ଭାଙ୍ଗିବା ଯନ୍ତ୍ର
୭. ଗୁଣ୍ଡ କରିବା ଯନ୍ତ୍ର
୮. ଯନ୍ତ୍ର ଝଲିତ ଝଲୁଣୀ
୯. ପ୍ୟାକିଂ ଯନ୍ତ୍ର
୧୦. ଆବଶ୍ୟକୀୟ ଷିଲ୍ ଏବଂ ପ୍ଲାଷ୍ଟିକ ପାତ୍ର, ଓଜନ ଯନ୍ତ୍ର, ଟେବୁଲ୍ ଇତ୍ୟାଦି

ପ୍ରକ୍ରିୟାକରଣ ଯନ୍ତ୍ରପାତିର ରକ୍ଷଣାବେକ୍ଷଣା

ଯନ୍ତ୍ରପାତି ଗୁଣ୍ଡିକର ସଠିକ୍ ପରିଚାଳନା ଦ୍ୱାରା ଏହାର ଦକ୍ଷତା ଏବଂ କାର୍ଯ୍ୟକାଳ ବୃଦ୍ଧି ପାଇଥାଏ । ସେଗୁଣ୍ଡିକର ଉପଯୁକ୍ତ ରକ୍ଷଣାବେକ୍ଷଣା ଓ ମରାମତି ମଧ୍ୟ କରିବା ଉଚିତ୍ ।

୧. ମରାମତି ସମୟରେ ବିଦ୍ୟୁତ୍ ସରବରାହ ବନ୍ଦ କରନ୍ତୁ ।
୨. ଯନ୍ତ୍ରପାତିର ବ୍ୟବହାର ପରେ ଭଲ ଭାବରେ ସଫା କରିବା ଉଚିତ୍ । ପ୍ରଥମେ ଓଦା କପଡା ଓ ପରେ ଛତା ଦ୍ୱାରା ସଫା କରନ୍ତୁ ।
୩. ଯନ୍ତ୍ରପାତି ଝଲନା, ରକ୍ଷଣାବେକ୍ଷଣା ଓ ମରାମତି ପାଇଁ କର୍ମଚାରୀମାନଙ୍କୁ ତାଲିମ୍ ପ୍ରଦାନ କରିବା ।
୪. ପ୍ରତି ସପ୍ତାହ ବା ପନ୍ଦର ଦିନରେ ଯନ୍ତ୍ରପାତିର ବିଭିନ୍ନ ଅଂଶକୁ ତଦାରଖ କରିବା ଓ ଆବଶ୍ୟକୀୟ ପଦକ୍ଷେପ ନେବା । ନଟ୍, ବୋଲ୍ଟ ଓ ସ୍କ୍ରୁ ଆଦି ଟାଇଟ୍ କରିବା ।
୫. ଯନ୍ତ୍ରପାତି ଝଲିବା ସମୟରେ ଅସ୍ୱାଭାବିକ ଶବ୍ଦହେଲେ, ତୁରନ୍ତ ଯନ୍ତ୍ରଟିକୁ ବନ୍ଦ କରି ତଦାରଖ କରିବା ଉଚିତ୍ ।



୬. ପ୍ରତି ଯନ୍ତ୍ରପାତିର ରକ୍ଷଣାବେକ୍ଷଣା ସମ୍ପର୍କୀୟ ସମୟ ସାରଣୀ ପ୍ରସ୍ତୁତ କରିବା ଏବଂ ଗୋଟିଏ ରେଜିଷ୍ଟରରେ ରକ୍ଷଣାବେକ୍ଷଣା ସମ୍ବନ୍ଧୀୟ ବିବରଣୀ ଲିପିବଦ୍ଧ କରିବା ।
୭. ସବୁ ବିଦ୍ୟୁତ୍ ଝଲିତ ଯନ୍ତ୍ରପାତି ଗୁଡ଼ିକ ଯାଞ୍ଚି ସହ ସଂଯୋଗ କରିବା ଉଚିତ୍ । ସବୁ ସଂଯୋଗ ସ୍ଥଳକୁ ଘୋଡ଼ଣି ଦ୍ୱାରା ବନ୍ଦ ରଖିବା ଏବଂ ସମ୍ବେଦନଶୀଳ ଅଞ୍ଚଳକୁ ସର୍ବସାଧାରଣ ପ୍ରବେଶ କଟକଣା କରିବା ।
୮. ଯନ୍ତ୍ରପାତି ଗୁଡ଼ିକୁ ବାୟୁର ଆର୍ଦ୍ରତା ଏବଂ ମୃଷ୍ଟା ଦାଉରୁ ରକ୍ଷା କରିବା । ଯନ୍ତ୍ରର ସମସ୍ତ ଆଗମନ ଓ ନିର୍ଗମନ ଦ୍ୱାରାକୁ ଯନ୍ତ୍ର ଝଲି ନଥିବା ସମୟରେ ବନ୍ଦ ରଖିବା ।
୯. ଯନ୍ତ୍ରପାତିରେ ବ୍ୟବହୃତ ମୋଟର, କଳଙ୍କି, ଷ୍ଟ ଆଦି ଶସ୍ୟ ସହିତ ଯେପରି ନ ମିଶେ ସେଥିପ୍ରତି ଯତ୍ନ ନେବା ।
୧୦. ଯନ୍ତ୍ରପାତି ଗୁଡ଼ିକ କଂକ୍ରିଟ୍ ଚଟାଣ ଆଧାରରେ ନଟ୍, ବୋଲ୍ଟ ଦ୍ୱାରା ଭଲ ଭାବରେ ବସାଇବା ।

ପ୍ରକ୍ରିୟାକରଣ ଯନ୍ତ୍ରପାତି ଝଲନାଗତ ସମସ୍ୟା ଓ ପ୍ରତିକାର

୧. ଯନ୍ତ୍ରପାତିର ବେରିଂ ଅକାମୀ ହେବା

- (କ) ବିଭିନ୍ନ ଯନ୍ତ୍ରପାତିରେ ଲାଗିଥିବା ବେରିଂରେ ନିୟମିତ ଗ୍ରୀଜ୍ ଦେବା ।
- (ଖ) ମଝିରେ ମଝିରେ ତଦାରଖ କରି ବେରିଂ ଭାଙ୍ଗିବା ପୂର୍ବରୁ ନୂଆ ଲଗାଇବା

୨. ଯାନ୍ତ୍ରିକ ଝବିଗତ ତ୍ରୁଟି

- (କ) ଯନ୍ତ୍ରପାତି ଗୁଡ଼ିକରେ ଲାଗିଥିବା ଯାନ୍ତ୍ରିକ ଝବିର କାର୍ଯ୍ୟକାଳ ଅବଧି ପୂରିବା ପରେ ନୂଆ ଲଗାଇବା ।

- (ଖ) ଯନ୍ତ୍ରକୁ ଓଭରଲୋଡିଂରେ ନ ଚଳାଇବା ।

୩. ଅଧିକ ବିଦ୍ୟୁତ୍ ଶକ୍ତି ନେବା ବା ଓଭରଲୋଡିଂ

- (କ) ନିୟମିତ ହାରରେ ଯନ୍ତ୍ରକୁ ଶସ୍ୟ ଛାଡିବା ।
- (ଖ) ଓଭରଲୋଡିଂ ଜନିତ ସତର୍କ ସୂଚନାଘଣ୍ଟି କିମ୍ବା ରିଲେ ଲଗାଇବା ।

୪. ସଫା ଓ ଶ୍ରେଣୀକରଣ ଯନ୍ତ୍ର

- (କ) ନିର୍ଗମନ ଦ୍ୱାରକୁ ଆବଶ୍ୟକ ମୁତାବକ ଖୋଲିବା ।
- (ଖ) ଦାନା ଅନୁସାରେ ଝଲୁଣାର ଜାଲି ବଦଳାଇବା ।
- (ଗ) କାମ ଶେଷ ହେବାପରେ ଜାଲି ସଫାକରିବା ।

୫. ଗୋଡ଼ି ବାନ୍ଧିବା ଯନ୍ତ୍ର

- (କ) ଆବଶ୍ୟକ ମୁତାବକ ପବନ ପଶିବା ଦ୍ୱାରକୁ ଖୋଲିବା ଯେପରି ଗୋଡ଼ି ପଛକୁ ଯିବ ଓ ଦାନା ଆଗକୁ ଗଡ଼ି ଆସିବ ।

୬. ଷୋପା ଛଡ଼ାଇବା ଯନ୍ତ୍ର

- (କ) ଯନ୍ତ୍ରର ଆଗମନ ଓ ନିର୍ଗମନ ଦ୍ୱାରକୁ ଆବଶ୍ୟକ ମୁତାବକ ନିୟନ୍ତ୍ରଣ କରି ଯନ୍ତ୍ର ଭିତରକୁ ଶସ୍ୟଦାନା ଛାଡିବା ଯେପରି ଅଧିକ ଗୁଣ୍ଡ ନ ହୋଇ ଷୋପା ଠିକରେ ଛାଡିବ ।

୭. ଗୁଣ୍ଡ କରିବା ଯନ୍ତ୍ର

- (କ) ଗୁଣ୍ଡର ଆବଶ୍ୟକତା ଅନୁଯାୟୀ ଜାଲି ବଦଳାଇବା ।
- (ଖ) ସଠିକ୍ ମାତ୍ରାରେ ଦାନା ଯନ୍ତ୍ର ଭିତରକୁ ଛାଡିବା ।



ଲଘୁଶସ୍ୟର ମାନ

ଖାଦ୍ୟ ନିୟମକ ମାନ ଅନୁସାରେ ଗୋଟା କିମ୍ବା ଚୋପାଛଡା ଲଘୁଶସ୍ୟରେ ଜଳାୟ ଅଂଶର ପରିମାଣ ସର୍ବାଧିକ ୧୩%, ଅନ୍ୟାନ୍ୟ ଖାଇବା ଶସ୍ୟର ସର୍ବାଧିକ ୨%, ବାହ୍ୟ ପଦାର୍ଥର ପରିମାଣ ସର୍ବାଧିକ ୧%, ଭଜା ଓ ପୋକା ଶସ୍ୟ ସର୍ବାଧିକ ୪% ଏବଂ ଅପକ୍ୱ ଓ ସଂକୃତିତ ଶସ୍ୟର ପରିମାଣ ସର୍ବାଧିକ ୫% ମଧ୍ୟରେ ରହିବା ଦରକାର । ଏତଦ୍ ଭିନ୍ନ ମାଣ୍ଡିଆ ଗୁଣ୍ଡରେ ଜଳାୟ ଅଂଶର ପରିମାଣ ସର୍ବାଧିକ ୧୦% ଏବଂ ମାଲୁରେ ସର୍ବାଧିକ ୫% ମଧ୍ୟରେ ରହିବା ଆବଶ୍ୟକ । ଏଥିରେ ଜଉରିକ୍ ଏସିଡ୍ ମାତ୍ରା କିଲୋଗ୍ରାମ ପିଛା ୧୦୦ ମି.ଗ୍ରା.ରୁ ଅଧିକ ହେବା ଉଚିତ୍ ନୁହେଁ । ଏଥିରେ କୌଣସି ପ୍ରକାର ବିଷାକ୍ତ ପଦାର୍ଥ ଓ ଶସ୍ୟ, ରାସାୟନିକ ରଙ୍ଗ ଏବଂ ମୂଷାର କେଶ ଓ ମଳ ମିଶି ନଥିବା ଆବଶ୍ୟକ । ଏହାର ପ୍ୟାକେଟରେ ସବୁ ତଥ୍ୟର ସୂଚନା ଥିବା ଦରକାର ।

ଲଘୁଶସ୍ୟର ପ୍ରସ୍ତୁତ ଗୁଣ୍ଡର ମାନ

ସଫା ଶସ୍ୟକୁ କଳରେ ଗୁଣ୍ଡକରି ଏବଂ ଉପଯୁକ୍ତ ଛିଦ୍ରଯୁକ୍ତ ଜାଲିରେ ଚଳାଇ ଲଘୁଶସ୍ୟର ଗୁଣ୍ଡ ପ୍ରସ୍ତୁତ କରାଯାଏ । ଏଥିରେ କୌଣସି ଅସ୍ୱଭାବିକ ଗନ୍ଧ, ଜିଅନ୍ତାପୋକ କିମ୍ବା ମୃତ ପୋକର ଅଂଶ ନଥିବା ଉଚିତ୍ ।

ବିଭିନ୍ନ ମାନ	ମାଣ୍ଡିଆ	ଜଞ୍ଜାର	ଲଘୁଶସ୍ୟର ମିଶ୍ର ଅଟା
ଜଳାୟଅଂଶ, ସର୍ବାଧିକ %	୧୦	୧୨	୧୧
ଅଶୋଧିତ ତନ୍ତୁ ଜାତୀୟ ପଦାର୍ଥ, ସର୍ବାଧିକ %	୪.୫	-	-
ଅଶୋଧିତ ପୁଷ୍ଟିସାର, ସର୍ବନିମ୍ନ %	୭.୦	୮.୫	୮.୦
ଅମ୍ଳରେ ଅଦ୍ରବୀଭୂତ ଭସ୍ମ, ସର୍ବାଧିକ %	୦.୧୫	୦.୧୫	୦.୧୫
ଗୁଣ୍ଡର ଆକାର	୧ମି.ମି.	୧ ମି.ମି.	୧ ମି.ମି.
ଜଉରିକ୍ ଏସିଡ୍, ମି.ଗ୍ରା./କି.ଗ୍ରା. ସର୍ବାଧିକ %	୧୦୦	୧୦୦	୧୦୦

ଲଘୁଶସ୍ୟ ପ୍ରକ୍ରିୟାକରଣ ଶିଳ୍ପପାଇଁ ପରିଷ୍କାର ପରିଚ୍ଛନ୍ନତା ନିୟମାବଳୀ

ଦୂଷିତ ଖାଦ୍ୟ ଏବଂ ଜଳର ବ୍ୟବହାର ଦ୍ୱାରା ରୋଗ ବ୍ୟାପିଥାଏ । ତେଣୁ ଖାଦ୍ୟ ପ୍ରକ୍ରିୟାକରଣର ପ୍ରତି ପର୍ଯ୍ୟାୟରେ ସଫାସୁତର ରହିଲେ ରୋଗରୁ ରକ୍ଷା ପାଇବା ସହିତ ଖାଦ୍ୟର ସଂରକ୍ଷଣ ଅବଧି ବଢିଥାଏ ।

୧. ପ୍ରକ୍ରିୟାକରଣ ଶିଳ୍ପ ପରିଷ୍କାର ସ୍ଥାନରେ ଏବଂ ସଫା ପରିବେଶରେ ପ୍ରତିଷ୍ଠା କରିବା ଦରକାର ।
୨. ପ୍ରକ୍ରିୟାକରଣ ଶିଳ୍ପରେ କଞ୍ଚାମାଲ୍ ଓ ଉତ୍ପାଦ ସଂରକ୍ଷଣ ତଥା ପ୍ରକ୍ରିୟାକରଣ ନିମିତ୍ତ ପର୍ଯ୍ୟାପ୍ତ ସ୍ଥାନ ଥିବା ଆବଶ୍ୟକ ।
୩. ପ୍ରକ୍ରିୟାକରଣ ଗୃହ ସଫା, ଆଲୋକିତ, ବାୟୁ ଚଳାଚଳ ଉପଯୋଗୀ ହୋଇଥିବା ସଙ୍ଗେ ସଙ୍ଗେ ଯିବା ଆସିବା ପାଇଁ ମୁକ୍ତ ଜାଗା ଥିବା ଉଚିତ୍ ।
୪. ଚଟାଣ, ଛାତ ଓ କାନ୍ଥ ଭଳି ଅବସ୍ଥାରେ ଟିକ୍‌କଣ ରଖିବା ଦରକାର ଯେପରିକି ସଫା କରିବା ସହଜ ହେବ ।
୫. ପ୍ରକ୍ରିୟାକରଣ ଏବଂ ସଂରକ୍ଷଣ ଗୃହକୁ କାଟପଟଙ୍ଗ ରହିତ କରିବା ସହିତ ଦରକାର ମୁତାବକ କାଟନାଶକ ବ୍ୟବହାର କରାଯାଇପାରେ । ଝରକା, କବାଟ, ଏବଂ ଅନ୍ୟାନ୍ୟ ଖୋଲା ଜାଗାକୁ ଜାଲିଦ୍ୱାରା ବନ୍ଦ କରାଯିବା ଉଚିତ୍ ।



୬. ପ୍ରକ୍ରିୟାକରଣରେ ବ୍ୟବହୃତ ଜଳ ପିଇବା ଉପଯୋଗୀ ହେବା ଆବଶ୍ୟକ ଏବଂ ଜଳଯୋଗାଣ ସବୁବେଳେ ଉପଲବ୍ଧ ହେବା ଦରକାର । ଆବଶ୍ୟକ ସ୍ଥଳେ ପାଣିଟାଙ୍କିର ବ୍ୟବସ୍ଥା ମଧ୍ୟ କରାଯାଇପାରେ ।
୭. ଯନ୍ତ୍ରପାତି ଗୁଡ଼ିକ ସଫା କରିବା ପାଇଁ ସହଜ ବ୍ୟବସ୍ଥା ଥିବା ଉଚିତ୍ ।
୮. ଯେଉଁ ପାତ୍ର କିମ୍ବା ଯନ୍ତ୍ରପାତି ବ୍ୟବହାର ଦ୍ୱାରା ଖାଦ୍ୟ କ୍ଷତିକାରକ ଧାତବ ପଦାର୍ଥ ଦ୍ୱାରା ଦୂଷିତ ହେବାର ସମ୍ଭାବନା ଥାଏ, ତାହା ବ୍ୟବହାର କରିବା ଉଚିତ୍ ନୁହେଁ ।
୯. ସବୁ ଯନ୍ତ୍ରପାତି ଗୁଡ଼ିକ ଭଲ ଭାବରେ ସଫା କରି, ଧୋଇ, ଶୁଖାଇ ଠିକ୍ ସ୍ଥାନରେ ରଖାଯାଏ ଯେପରି ଜୀବାଣୁ କିମ୍ବା ଫିଙ୍ଗି ହେବ ନାହିଁ ।
୧୦. ଯନ୍ତ୍ରପାତି ଗୁଡ଼ିକ କାନ୍ଥଠାରୁ ଦୂରକୁ ବସାଯାଇଥାଏ ଯେପରିକି ସେଗୁଡ଼ିକ ଠିକ୍ରେ ଅନୁଧ୍ୟାନ କରିହେବ ।
୧୧. ଜଳ ଓ ବର୍ଜ୍ୟବସ୍ତୁ ନିଷ୍କାସନ ନିମିତ୍ତ ସଠିକ୍ ବ୍ୟବସ୍ଥା ଥିବା ଦରକାର ।
୧୨. ଶ୍ରମିକମାନେ ସଫା ସୁତରା ରହିବା ସଙ୍ଗେ ସଙ୍ଗେ ପ୍ରକ୍ରିୟାକରଣ ସମୟରେ ନିର୍ଦ୍ଧାରିତ ପୋଷାକ, ସଫା ଆଫୁନ, ଗ୍ଲୋଭ୍ସ ଓ ଟୋପି ପିନ୍ଧିବା ଉଚିତ୍ ।

୬. ପ୍ରକ୍ରିୟାକରଣରେ ବ୍ୟବହୃତ ଜଳ ପିଇବା ଉପଯୋଗୀ ହେବା ଆବଶ୍ୟକ ଏବଂ ଜଳଯୋଗାଣ ସବୁବେଳେ ଉପଲବ୍ଧ ହେବା ଦରକାର । ଆବଶ୍ୟକ ସ୍ଥଳେ ପାଣିଟାଙ୍କିର ବ୍ୟବସ୍ଥା ମଧ୍ୟ କରାଯାଇପାରେ ।
୭. ଯନ୍ତ୍ରପାତି ଗୁଡ଼ିକ ସଫା କରିବା ପାଇଁ ସହଜ ବ୍ୟବସ୍ଥା ଥିବା ଉଚିତ୍ ।
୮. ଯେଉଁ ପାତ୍ର କିମ୍ବା ଯନ୍ତ୍ରପାତି ବ୍ୟବହାର ଦ୍ୱାରା ଖାଦ୍ୟ କ୍ଷତିକାରକ ଧାତବ ପଦାର୍ଥ ଦ୍ୱାରା ଦୂଷିତ ହେବାର ସମ୍ଭାବନା ଥାଏ, ତାହା ବ୍ୟବହାର କରିବା ଉଚିତ୍ ନୁହେଁ ।
୯. ସବୁ ଯନ୍ତ୍ରପାତି ଗୁଡ଼ିକ ଭଲ ଭାବରେ ସଫା କରି, ଧୋଇ, ଶୁଖାଇ ଠିକ୍ ସ୍ଥାନରେ ରଖାଯାଏ ଯେପରି ଜୀବାଣୁ କିମ୍ବା ଫିଙ୍ଗି ହେବ ନାହିଁ ।
୧୦. ଯନ୍ତ୍ରପାତି ଗୁଡ଼ିକ କାନ୍ଥଠାରୁ ଦୂରକୁ ବସାଯାଇଥାଏ ଯେପରିକି ସେଗୁଡ଼ିକ ଠିକ୍ରେ ଅନୁଧ୍ୟାନ କରିହେବ ।
୧୧. ଜଳ ଓ ବର୍ଜ୍ୟବସ୍ତୁ ନିଷ୍କାସନ ନିମିତ୍ତ ସଠିକ୍ ବ୍ୟବସ୍ଥା ଥିବା ଦରକାର ।
୧୨. ଶ୍ରମିକମାନେ ସଫା ସୁତରା ରହିବା ସଙ୍ଗେ ସଙ୍ଗେ ପ୍ରକ୍ରିୟାକରଣ ସମୟରେ ନିର୍ଦ୍ଧାରିତ ପୋଷାକ, ସଫା ଆଫୁନ, ଗ୍ଲୋଭ୍ସ ଓ ଟୋପି ପିନ୍ଧିବା ଉଚିତ୍ ।

୧୩. ସଂକ୍ରାମକ ରୋଗରେ ଆକ୍ରାନ୍ତ ଶ୍ରମିକକୁ ଖାଦ୍ୟ ପ୍ରକ୍ରିୟାକରଣ କାର୍ଯ୍ୟପାଇଁ ଅନୁମତି ଦିଆଯିବ ନାହିଁ । କୌଣସିବ୍ୟକ୍ତିର କଟା କିମ୍ବା ଖଣ୍ଡିଆ ହୋଇଥିଲେ ତାକୁ ଘୋଡ଼ାଇ ରଖିବା ଉଚିତ୍ ଏବଂ ସେ ଖାଦ୍ୟର ପ୍ରତ୍ୟକ୍ଷ ସଂସ୍ପର୍ଶରେ ଆସିପାରିବ ନାହିଁ ।
୧୪. ଶ୍ରମିକ ନଖ ଠିକ୍ରେ କାଟିବା ଉଚିତ୍ । କାମ ପୂର୍ବରୁ କିମ୍ବା ପ୍ରତିଥର ପାଇଖାନା ବ୍ୟବହାର ପରେ ହାତକୁ ସାବୁନରେ ଭଲ ଭାବରେ ଧୋଇବା ଦରକାର । ଖାଦ୍ୟ ପ୍ରକ୍ରିୟାକରଣ ବେଳେ ଦେହ କିମ୍ବା ମୁଣ୍ଡ କୁଣ୍ଡାଇବା ଉଚିତ୍ ନିହେଁ ।
୧୫. ଶ୍ରମିକ ମାନେ ତିଳା ଅଳଙ୍କାର ଆଦି ପିନ୍ଧିବା ଉଚିତ୍ ନୁହେଁ ।
୧୬. ଖାଦ୍ୟ ପ୍ରକ୍ରିୟାକରଣ ସମୟରେ ଖାଇବା, ପାନ ଷ୍ଟେବାଇବା, ସିଗାରେଟ୍ ଟାଣିବା କିମ୍ବା ନାକ ପୋଛିବା ମନା ।
୧୭. ଅପମିଶ୍ରଣ ନହେବା ପାଇଁ ରଖାଯାଇଥିବା ପ୍ରତିଟି ପଦାର୍ଥ ଏବଂ ବିକ୍ରିପାଇଁ ଉର୍ଦ୍ଧ୍ୱ ଦ୍ରବ୍ୟକୁ ଉପଯୁକ୍ତ ସୂଚନା ସହ ଘୋଡ଼ାଇ ରଖିବା ଉଚିତ୍ ।
୧୮. ପରିବହନ ପାଇଁ ଉତ୍ତୁଷ୍ଟମାନ ସଫା ଏବଂ ଭଲ ଅବସ୍ଥାରେ ଥିବା ଦରକାର ।



୧୯. ଖାଦ୍ୟ ପରିବହନ ସମୟରେ ସଠିକ୍ ତାପମାତ୍ରା ବଜାୟ ରଖିବା ଉଚିତ୍ ।
୨୦. କାଟନାଶକ ତଥା ଅନ୍ୟାନ୍ୟ ରାସାୟନିକ ପଦାର୍ଥ ଖାଦ୍ୟ ସଂରକ୍ଷଣ କିମ୍ବା ପ୍ରକ୍ରିୟାକରଣ ସ୍ଥାନରୁ ଦୂରରେ ରଖିବା ଉଚିତ୍ ।
୨୧. ପ୍ରକ୍ରିୟାକରଣ ଘରେ ପଡିଥିବା ଖାଦ୍ୟ ପଦାର୍ଥ ବା ଶସ୍ୟ ଦାନକୁ ତୁରନ୍ତ ସଫା କରିବା ଦରକାର । ପାଚଖନା ଗୁଡିକୁ ନିୟମିତ ବ୍ୟବଧାନରେ ସଫା କରିବା ଉଚିତ୍ ।
୨୨. ଶ୍ରମିକ ମାନଙ୍କୁ ନିରାପତ୍ତା ସମ୍ପର୍କିତ ତାଲିମ୍ ଦିଆଯିବା ଉଚିତ୍ । ଶିଳ୍ପରୁ ବାହାରିଥିବା ବର୍ଜବସ୍ତୁ ନିର୍ଦ୍ଧାରିତ ସ୍ଥାନରେ ରଖିବା ଦରକାର ।

ଏହିଭଳି ବିଭିନ୍ନ ମୂଲ୍ୟଯୁକ୍ତ ଖାଦ୍ୟ ପଦାର୍ଥ ପ୍ରସ୍ତୁତ କରି ବିକ୍ରି କରିବାକୁ ହେଲେ ନିମ୍ନୋକ୍ତ କେତୋଟି ଦିଗ ପ୍ରତି ଧ୍ୟାନ ଦେବା ଆବଶ୍ୟକ ।

୧. ଗୁଣାତ୍ମକ ଉତ୍ପାଦ ପ୍ରସ୍ତୁତ ପାଇଁ ଉପାଦାନ ଗୁଡିକର ପରିମାଣ ଓ ମାନ ନିର୍ଦ୍ଧାରଣ ଏବଂ ଉପଯୁକ୍ତ ପ୍ରକ୍ରିୟାକରଣ ପଦ୍ଧତି ଅବଲମ୍ବନ ।
୨. ଖାଦ୍ୟ ପ୍ରକ୍ରିୟାକରଣରେ ଉପଯୁକ୍ତ ରାସାୟନିକ ସଂରକ୍ଷକ ପଦାର୍ଥର ଯଥୋଚିତ ବ୍ୟବହାର, ଖାଦ୍ୟ ନିରାପତ୍ତା ଓ ସ୍ୱଚ୍ଛତା ନିୟମ ପାଳନ ।
୩. ଉପଯୁକ୍ତ ପ୍ରକ୍ରିୟାକରଣ ଯନ୍ତ୍ରପାତିର ଚୟନ, ସଠିକ୍ ପରିଚ୍ଛେଦନା ଓ ରକ୍ଷଣା ବେକ୍ଷଣା ।
୪. ଉପଯୁକ୍ତ ପ୍ୟାକିଂ ପଦାର୍ଥର ଚୟନ ଏବଂ ଲେବଲିଂର ନିୟମ ଅନୁଯାୟୀ ଖାଦ୍ୟପଦାର୍ଥର ପୂର୍ଣ୍ଣତତ୍ତ୍ୱ ଓ ଅନ୍ୟାନ୍ୟ ସୂଚନାର ସବିଶେଷ ବିବରଣୀ ପ୍ରଦାନ ।
୫. ପ୍ରକ୍ରିୟାକୃତ ଖାଦ୍ୟ ପଦାର୍ଥର ନିଜସ୍ୱ ବ୍ରାଣ୍ଡିଂ, ବଜାର ତିଆରି ଏବଂ ଜନ ସଚେତନତା ସୃଷ୍ଟି କରିବା ।

ଲଘୁଶସ୍ୟ ଉତ୍ପାଦନ ହେଉଥିବା ଅଞ୍ଚଳରେ ପ୍ରକ୍ରିୟାକରଣ ଶିଳ୍ପ ପ୍ରତିଷ୍ଠା ଦ୍ୱାରା ଏହାର ସୁବିନିଯୋଗ ସହିତ ଗ୍ରାମାଞ୍ଚଳରେ ଅର୍ଥନୈତିକ ବିକାଶ ହୋଇପାରିବ । ଏହି ଉଦ୍ୟୋଗ ସ୍ୱୟଂ ସହାୟକ ଗୋଷ୍ଠୀ ତଥା ବେକାର ଯୁବକ ମାନଙ୍କୁ ନିଯୁକ୍ତି ସୁଯୋଗ ଦେଇପାରିବ ଏବଂ ସେମାନେ ଲାଭବାନ୍ ହୋଇପାରିବେ ।



EPILOGUE

The whole content of this compendium is based on the Skill Development Training program on “Harvest and Post Harvest Machine Assistant technician” under Agricultural Skill Council of India (ASCI) conducted by Krishi Vigyan Kendra, Nayagarh, OUAT. The compendium will provide the information related to Harvest and Post Harvest operation of the major commodities of Nayagarh District Viz: Rice, Pulses, Millets, Sugarcane, Fruits and vegetables etc. Some of the technologies which are profitable and are being practised by the farmers are also included in the compendium. Along with, the presentations delivered by some of the eminent professors are added to this bulletin to provide additional information on new and advanced technologies for harvest and post- harvest handling. This record will also provide technical information which are likely to be generated within next couple of years/months with achieving sustainable livelihood option.



44



Dal Processing Unit

(1) Business activity

- * Raw Materials :- Greengram
- * Final Product :- Mug Dal

(2) Quantity :- 100 Quintal, Rs = 7,00,000

(3) Duration : 2 Month

(4) Raw Materials Quantity, Grade & size

* Grade (1) :- 70 Quintal

(4) Detail on Processing Machine & Cost

Name of the Machine	Cost
Weight Machine	6000
Grader Machine	70000
Dryer Machine	50000
Destoner Machine	30000
Roaster Machine	50000
Dal huller	80,000
Polisher	50,000
Packaging Machine	5000

(5) Transportation cost - 1 trip = 100/-
10 trip = 1000/-

(6) Man Power Cost - * Labour cost 1 trip = 600
10 trip = 10 x 600 = 6000

(7) Operator Salary: 2 Month = 1×8000
 $2 \times 8000 = 16000$

(8) Other Misc. cost

* Electricity = 6000

* Packaging Material = 4000

* Building & House = 250000

(9) Raw Materials Quantity, Grade, & size & cost

* Grade (1) 75 Quintal

Approx rate = $1 \text{ Quintal} = 75 \times 120 = 9000$

* Grade (2) 20 Quintal

Approx rate = $20 \times 100 = 2,00,000$

* 3 Quintal Churi :- $1 \text{ Quintal} \times 20 = 200$

$3 \text{ Quintal} \times 20 = 6000$

* 1 Quintal Waste

(10) Profit & Project cost & Profit

12,78,000 $\rightarrow$ 11,06,000

(01) Dharmendra Bahera

(02) Sisir Kumar Pradhan

(03) Santilata Das

Processing Machinery	Jaggery Unit	PROJECT REPORT
① Crusher (Sugarcane) Machine	-	Price (Approx.)
② Pumping of Juice Using Motor Pump Set	-	80,000/-
③ Boiling (container 4 Nos.)	-	10,000/-
④ Processed @ Jaggery Storage Unit	-	5,00,000/-
⑤ Weight Machine	-	5,000/-
		6,05,000













(Publication No - 2025020425)