

Fabrication and Development of Turmeric Rhizome Cleaning Portable/ Mobile Unit

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Abstract—Turmeric (*Curcuma longa* L.) is a rhizomatous perennial crop from the ginger family (Zingiberaceae), commonly known as Curcuma, Curcum, Haridra and Indian saffron. Turmeric is a unique ingredient which can be used as a spice, colorant, and flavorant. It is most majorly used in south east part of Asia. This study deals with machine which work efficiently to clean the turmeric without boiling and steaming as the process of boiling and steaming, lots of important chemical get lost which decrease the quality of the turmeric. Turmeric has various vital essential oils and nutrients which get removed during the process of boiling and steaming. The development of such processing device will help the farmer to process the produce quickly and retain the best nutritional profile.

Introduction

Turmeric is an ancient spice derived from the rhizomes of **Curcuma longa** also known as '**Golden Spice of India**'

Turmeric has also been used for **centuries** in **India** in **Ayurvedic medicine**, which integrates the medicinal properties of herbs with food. Use of turmeric dates back nearly **4000 years to the Vedic culture in India**. It is extensively used in Ayurveda, Unani and Siddha medicine as home remedy for various diseases. It is a **perennial plant** having short stem with large oblong leaves, and bears ovate, pyriform or oblong rhizomes, which are often branched and brownish-yellow in colour.

Modern interest on turmeric started in **1970's** when researchers found that the herb may possess anti-inflammatory and antioxidant properties. Safety evaluation studies indicate that both turmeric and curcumin are well tolerated at a very high dose without any toxic effects.

India is a leading producer and exporter of turmeric in the world. Andhra Pradesh, Tamil Nadu, Orissa, Karnataka, West Bengal, Gujarat, Meghalaya, Maharashtra, Assam are some of the important states cultivating turmeric, of which, Andhra Pradesh alone occupies 38.0% of area and 58.5% of production. During 2013-2014, the country produced 12.29 lakh tonnes of turmeric from an area of 2.34 lakh ha.

As we know India is largest producer of Turmeric but the condition of turmeric farmers is not good the sell their

turmeric at low price in the market due to lack of processing equipment as it is too costly and not affordable by farmers. We have machines for this but Indians farmers cannot afford. This paper introduce a design and Fabrication of turmeric cleaner and slicer which is portable and mobile and also cheaper then other equipment available in the market. If the farmers use this machine then his or her income will boost up due to processing.

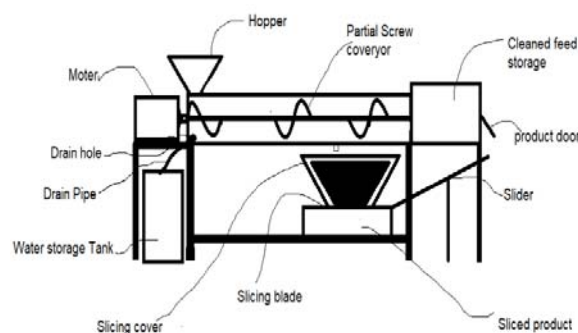


Figure1. layout of Turmeric Cleaner and Slicing machine

Construction and working of Turmeric Cleaner and Slicer

Today everyone makes machine based on their requirement so this makes the machine too bulky with large number of unit operation and increases the cost of the machine which is not affordable for farmers. Indian farmers need some machine which is cost effective and affordable so that they can also sell their product directly to the customer get the good price of it. Turmeric Cleaner and Slicer machine has three main part: 1.) Turmeric Cleaner 2.) Turmeric Slicer 3.) Power system. Other then these three parts it have other accessories also.

2.1 Turmeric cleaner :

This is the main part of the turmeric Cleaner and Slicer machine as it help in cleaning the turmeric rhizomes properly. This part of machine consists of various parts: 1) Hopper 2) Partial Screw Conveyor 3) Cycle line 4) Conveyor Casing 5)

Drain Hole and Pipe 6) Water storage Tank 7) Cleaned Feed Storage.

2.1.1 Hopper: This help in pouring the feed into the Turmeric cleaning system. There is a stopper at the base of the hopper which control the feed flow into the cleaning system. This also allows to pour water into the system for cleaning the feed and inner part of machine.(Figure 1)

2.1.2 Partial Screw Conveyor: Partial screw conveyor is a conveyor belt in which some of the screw is removed .only the screw lies near the hopper, mid of the conveyor and three-fourth distance from the hopper. This screw is run by a motor. This screw allows the water and feed to move forward with proper agitation which helps in cleaning the feed properly. This screw runs clock wise and anticlockwise so that proper feed cleaning can occur. This agitation is done with water and detergents so that the toxic substance or any other substances present on the surface of the rhizomes get easily removed and then drain out the detergent water and then run the machine with clean water so that the detergent on the surface of the rhizomes is removed. (Figure 1)

2.1.3 Cycle line: This play a important roll in pushing the water in forward direction in the partial screw conveyor. If this is not present in the machine then it is not possible to push the water and feed in forward direction. This lies outside the casing of the partial screw conveyor. This consist of a pipe of diameter 180mm which connect the end of the partial screw conveyor casing to starting point of the conveyor which circulates the water into the pipe but not the feed due to which a proper water cycle is formed and always water have unidirectional flow due to which feed also move in a particular direction and hence the movement can occur with proper way. If this is not present in the machine then is difficult to move the rhizomes because the screw is partial and want to move the water in forward direction but we know from Newton's 3rd law that every action there is equal and opposite reaction so the end casing will also force the rhizomes to move in backward direction and both forward and backward force will cancel out and the movement might not possible so this cycle is necessary for a proper flow of water wth proper pressure difference.

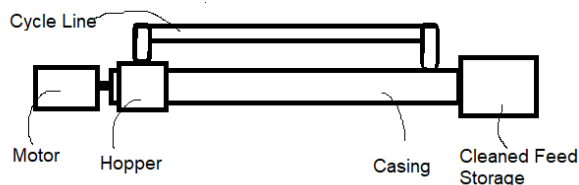


Figure 2) Top view of Machine

2.1.4 Conveyor Casing: This help in covering the conveyor and storing the water and feed. This connected with hopper at the starting point and also connected with cycle line at a particular side at starting and end point of the casing. At the end it is connected with cleaned feed storage with proper

sealing so that during the cleaning operation the water should not leak out from it. Once the cleaning operation is done then the feed is moved to the cleaned storage tank after draining out the water from the casing. Top of the casing is transparent and is removable for proper maintenance and cleaning of inner part of machine.

2.1.5 Drain Hole and Pipe: Drain hole is on the bottom of casing at the starting point Partial Screw Conveyor to remove the water. Drain hole is connected with drain pipe which help in drain out the water from casing to water storage tank.

2.1.6 Water Storage Tank: This lies just beneath the motor and is easily movable The water once used can be reuse for cleaning the rhizomes. Actually this is detergent water which can be use Twice or thrice for cleaning the rhizomes.

2.1.7 Cleaned Feed Storage: Once the cleaning operation is done, the Cleaned feed is then transferred to cleaned feed storage. This is attached with the end of the casing. This Consist of a flipping door which can be open for transferring the feed for slicing through slider. The transfer of feed into the cleaned feed storage by the force of conveyor after draining out the water.

2.2 Turmeric Slicer:

This part of unit operation make small pieces of the rhizomes which help in increasing the surface area and hence farmer can now sundry it and sell it in the market. This also consists of various parts: 1) Slider 2) Slicing Blade 3) Slicing Harder 4) Slicing Box.(Figure 3)

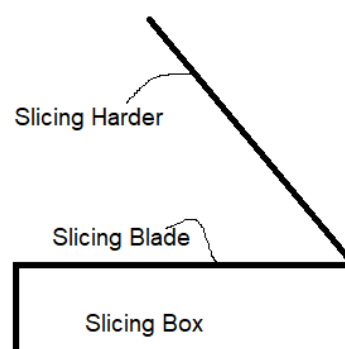


Figure 3) Side view Turmeric Slicer

2.2.1 Slider: Slider is starting from the door of cleaned Feed Storage and end at slicing machine. This direct the rhizomes to move to slicing blade

2.2.2 Slicing Blade: This is sharp blade which is used to cut the rhizomes. The blades are arranged is in cries cross way for efficient cutting of the rhizomes. The blade is made up of stainless steal.(Figure 4)

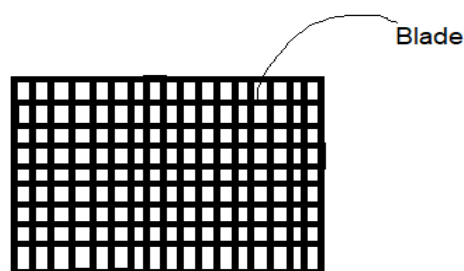


Figure 4) Slicing Blade

2.2.3 Slicing Harder : This help in sudden pressing the rhizome which is lying on the blade for cutting the rhizome in small pieces. The force of pressing depends on number of rhizomes are kept on the slicing blade. It is recommended to keep 6 rhizomes at a particular time.

2.2.4 Slicing Box: This is just beneath the blades so that the cutting gets collected in the box.

2.3 Power system:

There are two power system used in this machine. 1) Electrical Motor System 2) Hydraulic Power System.

2.3.1 Electrical Motor System: In this the motor is run on electricity which drives the screw conveyor. This motor can rotate in clockwise and anticlockwise so that the conveyor can also move in the same way and clean the rhizome. This is the only energy used for operating the machine.

2.3.2 Hydraulic Power System: It is used giving pressure to slicing harder so that it can move frequently and cut the rhizomes. This is manually operated.

How to use Turmeric Cleaner and slicer Machine

First of all switch on the motor so that the motor starts rotating so that the Partial screw conveyor will start rotating. Now add detergent water into the casing through hopper so that water flow in the casing and cycle line now gradually feed the rhizomes into it. After this rotate the partial screw conveyor with the help of motor for better clockwise and anticlockwise for proper cleaning after 2 to 3 minutes, drain out the detergent water and add clean water and do the same cleaning process. Make sure that during Draining, the motor is switched off. Now after cleaning drain out the water from the casing and then open the sealing of Cleaned Feed storage and then switched on the conveyor so that the feed can move in the cleaned feed Storage. Now gradually open the flipping door for passing the feed to the slicer. Slice the rhizomes and collect in the slicing box.

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