

“An implementation on Design & Development of Tuber Root Cleaning Machine”

Mr. S.B. Thakare
Assistant Professor

Mr. Handore Satvik S
B.E Student

Mr. Gurgude Bhushan B
B.E Student

Mr. Hiray Tushar Ambadas
B.E Student

Mr. Mogal Prashant Sudhakar
B.E Student

Department of Mechanical Engineering
Matoshri College of Engineering and Research Centre, Nashik

ABSTRACT:

The Automatic crop Washer may be a machine which could find its use in the agricultural fields. the basic crops like potatoes, carrots, radish, etc. after harvesting need to be cleaned off the soil and clay particles before transporting them from field to plug. Normally the farmers of Punjab (INDIA) follow a standard method of cleaning the carrots, radishes in which the roots are washed manually by hands and feet. Therefore, our project was supported giving the simplest solution to the present problem. We have developed an inexpensive root washer machine which each farmer in India can afford. This paper discusses the details of that machine. The muddy root crops are put inside the basis Crop Washer drum via a gap provided on circumference. Then the opening is closed using leather belts and locks. Provisions for pressurized water system inside the basis Crop Washer are made. The drum is then rotated by a motor and water under pressure is supplied within the drum. thanks to the rotation of the drum and the continuous supply of water the soil and clay articles are removed off the basis crops. The muddy water falls down through the slits provided in the drum. Hence cleaning the basis crops and making them ready for the vegetable market.

Keywords: vegetable, crops, grains, fruits, pesticides

INTRODUCTION

India is an agricultural country. The farmers who take the production of tuber roots in their farms are facing various problems of cleaning of tuber roots before sell in market. The problems like manpower, time, money & water required to clean. The traditional approach that is being used by the farmers involves using of big perforated crates or tubs. The soiled crops are put in the perforated crates and are washed manually using a jet stream of water. The crops have to be regularly shuffled with hand for proper cleaning. This has been proved to be a very time-consuming process and requires a lot of labour. Also, during the winter season this process becomes very challenging as laborers are constantly in contact with the cold water. A backlog of unwashed crops can often pile up and some are rendered either unfit for sale or unfit for personal consumption. For these reasons we had looked into a mechanized way of washing root crops. With the machine like the Tuber root cleaning machine we would be able to quickly clean root crops more efficiently and effectively. We wanted to share some best practices for harvest wash and improve the efficiency of farms. By conventional method for cleaning of tuber roots about 40 to 50 minutes are required for 1 quintal go carrots by 5 labors. By using this tuber root cleaning machine, we can reduce the time for 1 quintal of carrot to 10 to 15 minutes by only one labor. The tank for washing produce is made from perforated drum. The drum is positioned near drain pipe and helps to circulate water through the produce. Fresh water is added under pressure through a perforated pipe, which helps move floating produce toward drain end of the tank for removal after cleaning.

Adequately cleaning is a critical operation in the production and distribution of fresh produce. This is especially true for the smaller scale, local agriculture operations such as less access to large scale cleaning operations. In an attempt to improve upon the traditional cleaning methods of root crop vegetables, a need for an innovative processing approach to the cleaning of their harvested organic produce to meet their special needs. Applying engineering design concepts and analysis, this report outlines the development of a

tuber root cleaning machine from computer model simulation to an actual working model. The methodologies of mechanical design, material acquisition is addressed. As per the previous design proposal, our goal is to develop a tuber root cleaning machine that can help to improve the efficiency as well as reducing amount of physical effort of labour put into the post-harvest cleaning of their root crops.

PROBLEM STATEMENTS:

Nowadays in the agriculture field, farmers are facing the problems of labors, time & money in farming of tuber roots (root crops). Before sell the tuber roots produced, all the local markets must be cleaned to make it appealing to customers. Carrot cleaning however is a lengthy & demanding process. Cleaning 1 quintal (100 kg) of carrots usually takes the labor of 12 people. It requires more efforts also

- The lack of efficiency in regards to post harvest washing of root crops.
- Post-harvest washing treatment of the crops and their greens should be improved.
- Carrot cleaning however is a lengthy & demanding process.

Thus, the new machine design should improve how root crops are being processed with a special regard for the preservation of the green tops; it should also strive for more water and energy use efficiency. However, it will need to adhere to constraints such as durability/longevity and cost.



Fig:carrots cleaning

LITERATURE SURVEY:

1. Dawn C. P. Amrose, & S. J. K. Annamalai from central institute of agricultural engineering, Coimbatore, Tamil Nadu, India had developed root crop washer on which they were published a research paper on 17 June, 2013. According this paper that root crop washer is, manually operated machine hence time consuming. Clean only 10 kg of root crops at a time in 20 minutes.
2. Henderson SM, Perey RL (1976). Agricultural Process Engineering, Washing is one of the primary unit operations for value addition of horticultural produce at farm level. Washers may be continuous or batch type. Batch type washers are recommended for small plants where use is intermittent and operating costs are not critical. Soaking in still or moving water is effective only if dirt or other surface undesirable is present in small quantities and is loosely attached to the product. Water sprays vary from low pressure wide angle to very high pressure directed jets and are very effective since they physically remove firmly attached pieces of dirt and agitate the mass of product, particularly if it is carried in a water bath. Sprays are suitable for most products, but the intensity and type of spray distribution must be carefully selected. Flood washing is done by a large quantity of water moving at a moderate to high speed over the product (Henderson and Perry, 1976).
3. R.N. Khenge, A.P. Magar, K.R. Khenge "International Journal of Trend in Research and Development, Volume 2(4), ISSN 2394-9333", Vegetables are washed in fields using a water jet delivered from a hosepipe and immersion soaking. These methods demand more labour but washing efficiency is very low due to non-removal of thin layer of surface mud coating. So, there

is a need for an efficient washer to remove the mud and other foreign matter present on the surface of the vegetables, more specifically for root crops (Murray and Judy, 1996). [2] Likewise, we have also tried to develop a design which is reliable, cheap and efficient. Four farms were visited to conduct case studies of their harvest wash as well as their food safety protocols. We identified the problems that came across while washing crops. The project began with understanding that harvest wash and pack labour is a large percentage for small scale diversified vegetable farms. A problem that was coded, faced by Indian farmers, is washing of the root crops post harvesting. These crops need to be cleaned properly from the

4. Ravdeep Singh Ghuman, from UG students, school of mechanical engineering, Chitkara university, Panjab, India had published a paper on “design & fabrication of automatic root crop washer,” according to that paper, Capacity of their machine is 20 kg at a time. And machine is automatically operated. Time required for cleaning is 15 minutes. The literature survey reveals that many designs have been proposed in the past for the present problem.

Working principle:

The working principle of this machine is based on centrifugal force and friction. Centrifugal force is an outward force which acts on the outer periphery of the body which is in rotation.

In this machine, due to rotation of the drum, centrifugal force is created in the drum which acts on carrots. Due to this centrifugal force carrots move outside on the inner wall of the drum. This inner wall of the drum is bounded by friction material so that friction is generated between carrots and inner wall of drum and hence cleaning is done.

It consists of the above part which is joined mechanically. There are two shafts used in this equipment. Input shaft and output shaft, input shaft is connected from external spline shaft which is made of C50 material. Power from the external spline shaft is transmitted to the input shaft. Input and output shafts are connected by belt drive. Two pulleys are used: the first input pulley and other is output pulley. Smaller pulley is mounted on the input shaft and larger pulley is mounted on the output shaft by a rectangular sunk key. Cylindrical roller bearings are used to support the both shafts. These two pulleys are connected by belt. Due to high grip and high-power transmission capacity the V belt is used. • Rotating drum is mounted on the output shaft. Preheated type drums are used. The high coefficient of friction material is bonded on the inner wall and outer wall of the drum to remove the soil particles.

Components Used : • Input shaft • Output shaft • Bearing • Pulley • Belt • Drum • Friction material • External spline shaft

Advantages

- It reduced time required for cleaning of tuber roots.
- It increases the cleaning efficiency of root crops after harvesting.
- It reduces the labour required for cleaning of tuber roots & hence labour cost.
- The overall objective of the project is to increase the rate of production of tuber roots by efficient cleaning method using mechanical systems with possible minimum cost.

Limitations

- Require Electricity or Tractor
- Water Requires for Cleaning

RESULT & CONCLUSION:

In this paper we successfully completed the objectives as given. We achieved

- To reduce time required for cleaning of tuber roots.
- To increase the cleaning efficiency of root crops after harvesting.
- To reduce the labour required for cleaning of tuber roots & hence labour cost.
- Therefore, the overall objective of the project is to increase the rate of production of tuber roots by efficient cleaning method using mechanical systems with possible minimum cost.

The designed tuber root cleaning machine has a 150 kg capacity and from design and calculations it is concluded that the machine will clean these tuber roots at a time efficiently by a single operator with minimum time and cost.

REFERENCES

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