Literature Review on Design & Development of Portable Charoli Desheller

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Abstract— Charoli (Buchanania lanzan Spreng; family Anacardiaceae) is a multipurpose tree and very important plant for rural and tribal economy. Because of very good demand of charoli nut in foreign market the government have shown interest in developing this industry, by increasing production and processing capacity. From the currently available resources this charoli kernel extraction is made manually by hand and thus takes intensive labor time with poor efficiency in getting whole kernel and rest kernels in broken forms. This paper focuses on reviewing the physical properties and to conceptualize a cost effective charoli desheller to improve the kernel extraction efficiency and reducing the kernel damage.

Key words: Charoli Nut Desheller, Nut Processing, Process Parameters

I. INTRODUCTION

Charoli is an income generating product of forest dependent communities of state of MP and Jharkhand. It is not cultivated commercially. However, it contributes 10 % of total forest product in collection based livelihood of forest dwellers of this region.

The fruit fetches a much lower price for the collectors than the kernel and hence, collectors usually grind the seed to obtain the kernel. Each tree can produce 3 to 4 kg of charoli sold for price of 100-130 Rs/kg, whereas the price of charoli kernel is around 500-1000 Rs/kg in the national market.

The hard shell is one of the problems in deshelling of nuts, its small size leads to the damage of kernel at the time of deshelling and spoil the kernel which reduce its economical value and also deteriorate the shelf life of it which leads to low storage capability.

Traditional processing method makes very small recovery of whole kernel and most of the rest are either broken or mashed completely, thus causes huge economical loss.

This research aims to develop a machine to improvise the nut deshelling efficiency and provide help to tribal peoples to gain high profit by selling the fresh kernels directly in the market by investing less capital.

For this review following criteria's were used:-

- Physical properties of charoli nut
- Identification of process parameters

II. LITERATURE REVIEW

A. *Physical characterization of charoli nut and kernel*

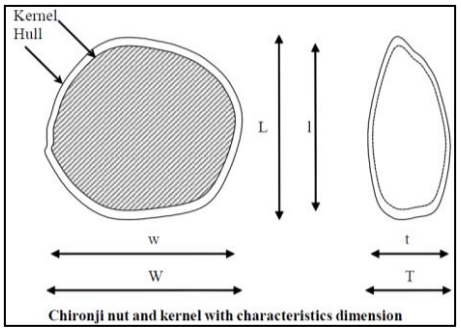

Fig. 1: Physical characterization of charoli nut and kernel

1) Kumar, Jitendra, Prabhakar, P.K., Srivastav, P.P. and Bhowmick, P.K. (2014)

Paper published in FSRJ (ISSN 2230-9403) shows study made on physical characteristics of charoli nut and kernel by determining various attributes that plays an important role for further deshelling processes.

This includes moisture content, average nut and kernel thickness, hardness of charoli nut, roundness of nut.

This result deduced that the charoli kernels will rather roll, like gram, than slide on their flat surfaces like oil bean seed. This tendency to either roll or slide is very important in the design of hoppers.

The average weight of charoli kernels was found to be 0.11g and that of complete nut varies from 0.15g to 0.39g.

The hardness value varies from 33.3 to 40.2 kg/mm2 for nuts dried till constant weight. Kernel to husk ratio is 0.29(wt/wt). Mean thickness of charoli nut is 7 mm. [1]

B. *Identification of process parameters*

1) S.D.Deshmukh, M.M. Dange, A.B.Gawande (2016)

Paper published in IJREST (ISSN 2454-5392) shows research on optimization of process parameters for charoli nut deshelling.

Raw material used was charoli nut with moisture content 7-8 %. The total time required by labor to deshell 200 gm sample of charoli nut was nearly 3h with whole kernel % as 12.375 and broken kernel % as 17.629.

The process showed significant difference in deshelling efficiency which increased with increase in clearance between discs up to certain value and shown slight increase with the increasing drying time.

Using RSM (response surface methodology) the independent parameters for charoli nut deshelling viz. clearance between discs, nut drying temperature, and nut drying time were optimized. They are found to be 12mm, 69 degree Celsius, and 160min resp. [2]

2) Jaspal Singh, R.K.Naik, S.Patel, N.K.Mishra.
Another paper published in IJERT (ISSN 2278-0181) shows a prototype fabricated to find the design parameters for improvising overall deshelling efficiency.

The prototype uses emery stones as in burr mill powered by 1hp motor. The results were found to be 14.22% whole kernel with clearance of 10mm at shelling disc speed of 240rpm. The prototype was provided with grader to separate whole kernel, husk and wasted kernels. [3]

III. NEED FOR DEVELOPING THE MACHINE

- To achieve higher deshelling efficiency
- To reduce processing time
- To reduce intensive human labor efforts
- To help tribal people in earning more profit with high quality kernel processing machine

IV. RESEARCH METHODOLOGY

In present study, a design prototype will be created using CAD modeling software. For assembly of machine some fabricated components and some readily available components suitable according to the design criteria will be taken.

The experiment will be carried out for different combinations of process parameters on machine with different size of charoli nuts.

Some alternative methods for charoli deshelling will be taken into consideration including shear cut mechanism and use of vibrating bed.

With optimization the size of machine will be reduced to make it easy to carry.

The obtained results will be compared with the previous prototypes and will be discussed for further finalization.

V. CONCLUSIONS

This review from previous study and research shows that in the current scenario government have evinced keen interest to improvise the design and mechanizing the traditional processes to reduce human efforts and help in development of forest and tribal communities

The previous research results gave us arbitrary values to continue experimentation as there are many factors that still need further optimizations.

The advancement will lead to further development of forest and tribal communities by providing them sources to earn income at small investment.

It is further required to adjust the disc rpm to reduce kernel damage and deshelling of most of the nuts, as higher disc speed can cause more crushing of nut than shell separation.

The clearance between discs should be adjusted in order get majority of deshelled nuts and better kernel.

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