



E-ISSN: 2618-0618

P-ISSN: 2618-060X

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www.agronomyjournals.com

2024; SP-7(6): 06-08

Received: 05-03-2024

Accepted: 09-04-2024

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International Journal of Research in Agronomy

Design and development of a paddle operated groundnut decorticator for small-scale farmers

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DOI: <https://doi.org/10.33545/2618060X.2024.v7.i6Sa.789>

Abstract

Shelling peanuts is a time-consuming and tedious task. This process provides less power, requires more effort from the user, and ultimately uses more energy. Therefore, the idea was developed to create a machine that requires less labor and less energy consumption. Performance evaluation of a pedal-operated peanut coring machine was evaluated using various treatment combinations of clearance and moisture content. The difference in the distance between the rotating drum and the friction plate, namely H.8 mm, 10 mm, 12 mm, and the water content of peanut pods is different. The peeling capacity, production capacity, peeling efficiency, unpeeled pod and kernel breakage were 92.41 kg/h, 51.95 kg grains/h, 86.37%, 13.62%, and 15.65%, respectively, at the best optimum values. The distance and moisture content combinations of 10 mm and 6.53% were found, respectively. The total unit cost of developing a pedal-operated groundnut picker was ₹14,000 and the operating cost including fixed and variable costs was ₹90.43/hour. The cost of shelling 1 kg of groundnut pods was estimated to be 0.97 ₹. The developed pedal-operated groundnut coring machine is reliable and satisfactory for selected varieties of groundnuts.

Keywords: Paddle operated groundnut decorticator, *Arachis hypogaea*, design, development, decorticating

Introduction

Groundnut is believed to have originated in South America, from where cultivation of groundnut spread to Brazil, southern Bolivia and North-western Argentina. India is the second largest producer of groundnut in the world and it occupies an important position in the Indian agricultural economy. It is one of the most important food and cash crops of the country accounting for more than 40 % of area under oilseeds and 60 % of oilseed production. Groundnut is a valuable source of edible oil (43-55%) and rich source of high protein (25-28%) for human beings and also work as a fodder for livestock. The main aim of this paper is to develop a mobile groundnut decorticator using the existing hand operated groundnut decorticator. Apart from this, the machine is designed to have good decorticating efficiency and low percentage breakage of peanuts.

Groundnuts most important action in groundnut processing as it permits the kernels and shell to be used with other post harvesting methods that take place after harvest, such as oil extraction or shell briquetting. It is done either by stripping, rubbing and impact action or any combined arrangement of these methods.

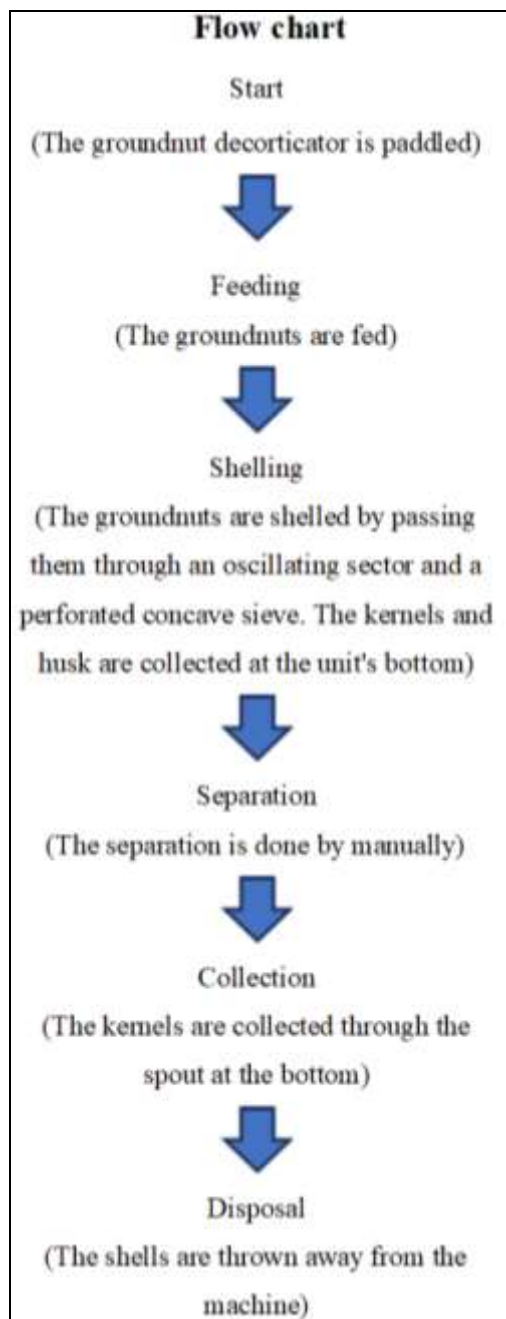
Groundnut is about 1661 kg/ha yield and the production is about 0.98 lakh tonnes (D.P.D., 2018). Decortication is most important action in groundnut processing as it permits the kernels and shell to be used with other post harvesting methods that take place after harvest, such as oil extraction or shell briquetting. It is done either by stripping, rubbing and impact action or any combined arrangement of these methods. The objectives of this project are:

- Design and fabricate a low-cost paddle operated groundnut decorticator machine.
- To determine the efficiency of machine.

Study area

The fabrication was carried out & performance study were carried out at Farm Machinery Workshop of BRSM College of Agricultural Engineering and Technology & Research Station,

Mungeli, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.).



Cost analysis

S. No.	Material	No. of pieces	Cost (Rs.)
01	Manual operated groundnut decorticator	1	2500
02	Bearing	2	80
03	Support bearing	2	500
04	Chain, Sprocket, Chain ring	1	350
05	Cycle Frame	1	500
06	Mild Steel Flat bar	4.5 (kg)	180
07	Mild Steel 'L' angle	20 (kg)	960
08	Mild Steel Round Rod	2.5 (kg)	110
		Total	5180

Results

S. No.	Materials	Weight (kg)	Percentage (%)
01	Total groundnut (Qt)	2.5	100
02	Weight of decorticate groundnut in kg (Qs)	1.595	63.8
02	Whole shelled groundnut (Qu)	1.475	59
03	Broken (Qd)	0.120	4.8
04	Crushed shells (Qc)	0.842	33.68
05	Whole groundnut with shell retained in machine (Qr)	0.054	2.16
06	Damaged groundnut (Qp)	0.009	0.36

Conclusion



Fig 2: Shelled groundnut

Essential components and actual view of machine



Fig 1: Actual view of paddle operated groundnut decorticator



Fig 3: Broken



Fig 4: Crushed shells

Calculations for sample of Groundnut

1. **Decorticating efficiency:** $((Q_s+Q_c+Q_p)/Q_t) \times 100 = ((1.595+0.842+0.009)/2.5) \times 100 = 97.84\%$
2. **Material efficiency:** $(Q_u/(Q_u+Q_d)) \times 100 = (1.475/(1.475+0.120)) \times 100 = 92.47\%$
3. **Overall Material efficiency:** $(Q_s/Q_t) \times 100 = (1.595/2.5) \times 100 = 63.8\%$
4. **Mechanical damage:** $(Q_d/(Q_u+Q_d)) \times 100 = (0.120/(1.475+0.120)) \times 100 = 7.52\%$
5. **Throughput capacity in 1 hour:** $(Q_s/T_m) = (1.595/219) \times 60 \times 60 = 26.219 \text{ kg/hr}$

Conclusion

Established it's far decided that, the machine conducted groundnut decorticator plan is taller alternative to use producer alternatively help conducted. Bureaucracy is to bicycle conducted because skilled's no power use that wills promotes to lower the bill of results. This scheme furthermore saves occasion and laborers. If we proceed continuous paintings, we were likely a better amount in very brief period. The occupied design concerning this apparatus is very plain, so skilled's no ability labour necessary to function a plan.

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