

	<p>Journal Homepage: -www.journalijar.com</p> <h2>INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)</h2> <p>Article DOI:10.21474/IJAR01/19392 DOI URL: http://dx.doi.org/10.21474/IJAR01/19392</p>	
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RESEARCH ARTICLE

DESIGN AND FABRICATION OF GROUNDNUT PODSEPARATOR

B. Mano¹, N. Satheswaran¹, S. Tamilan² and R. Sri Velmurugadass²

1. Assistant Professor, Department of Agriculture Engineering.
2. UG Student, Paavai Engineering College, Paavai Nagar, Pachal, Namakkal-637018.

Manuscript Info

Manuscript History

Received: 28 June 2024
Final Accepted: 30 July 2024
Published: August 2024

Key words:-

Groundnut, Pod Separation, Low Cost, Eco Friendly

Abstract

In India, Agriculture is the backbone. In a country like India, farmers grow groundnuts on a small scale. The major problem in groundnut production in countries like India is the lack of groundnut processing machines available to farmers. In the beginning, the workers separated the groundnut pods from their plants. They simply remove groundnut pods by their hands and separate them from the plants. The output obtained from this method, was very low because it was a very time-consuming process. It was also a boring work for the worker. The traditional method of separating pods from groundnut plants is by hand. The traditional method is not a sufficient method for separating the groundnut pods. Due to this manual process, identifying some major problems&overcomingthese problems some ideas or concepts are generated.

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Introduction:-

Groundnut is the major oil seed crop in India, and it plays a major role in bridging the vegetable oil deficit in the country. Groundnuts in India are available throughout the year due to a two-crop cycle harvested in March and rain-fed conditions. The awareness and concern for quality amongst Indian groundnut shellers and processors are growing steadily. Multiple sorting and grading are fast becoming a norm. Indian manufacturers can prepare and supply edible peanuts conforming to the highest standards Processed Peanuts. Apart from raw edible peanuts, India is also able to supply Blanched Peanuts, Roasted Salted Peanuts, Dry Roasted Peanuts, and a variety of peanut-based products. An efficient groundnut pod-removing machine is a device that takes off the shell of a peanut and keeps the whole kernel. One feeding can complete all the work of peanut shelling, separation, secondary shelling, cleaning, and kernel grading. It has the characteristics of a high pod removal rate, low damage rate, simple structure, convenient operation and easy maintenance, high shelling efficiency, and low cost.

Objectives:-

1. To design and fabricate of groundnut pod separator.
2. To design a separator for the sake of small-scale farmers with low initial investment with a simplified process.
3. To minimize the time for separating the groundnut pod from the plant body and also minimize the manpower.

Literature Review:-

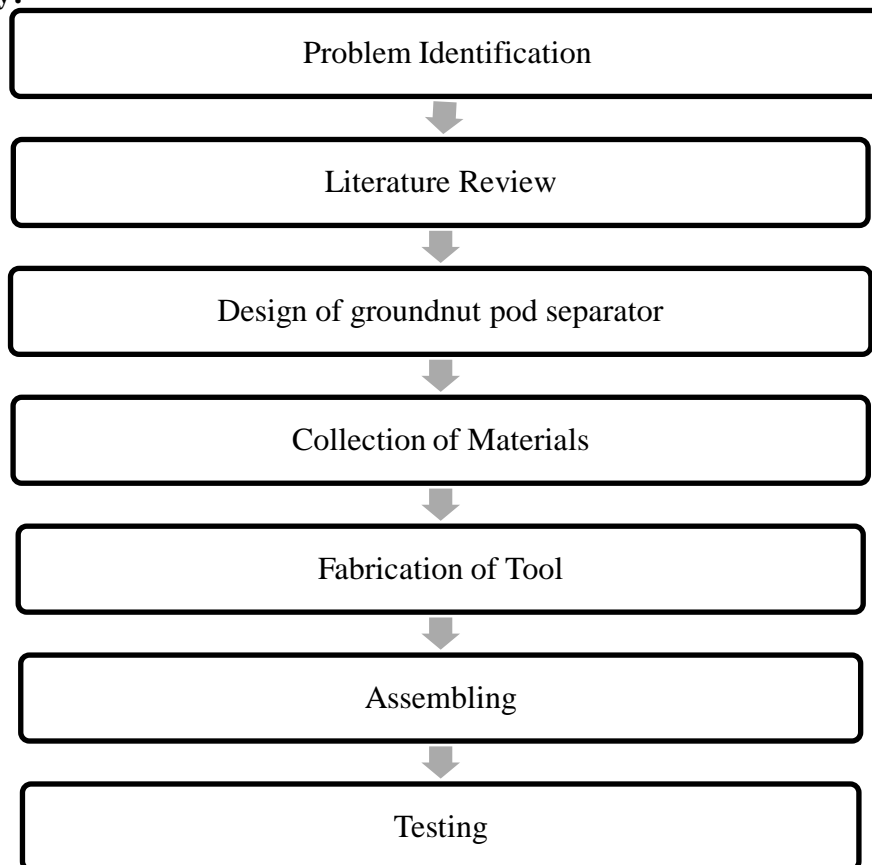
Y. Kalimuthu, et.al., (2021) entitled "SOLAR POWERED GROUNDNUT SEPARATOR MACHINE," said that Groundnut is grown on a small scale by farmers in developing countries like India. We say in their paper about

the design and fabrication of a groundnut shelling and separating machine electrically powered by a 1hp motor. In the beginning, the Groundnut pods were separated from their crops by the workers. The output obtained from this method was very low and it did not fulfill the market demand because it was a very time-consuming process. The machine has the capacity of shelling 400kg of groundnut per hour with shelling and separating efficiencies of 95.25% and 91.67% respectively.

K.D. Maina, et.al., (2020)entitled“**PERFORMANCE EVALUATION OF A MOTORIZED GROUNDNUTSHELLER**” saidthatthe Performance evaluation of a motorized groundnut Sheller was carried out to determine the efficiency of the machine, mechanical loss, and weight of shelled and unshelled groundnut and chaff weight in kilogram (kg). Two varieties of groundnut were used “Dan Kaduna” and “Dan Dakar”. A 7kg of unshelled groundnut was bought and both of the varieties were divided into five portions, the weight of each portion was measured with a weighing machine, and the result was recorded in a tabular form. The nut of the first portion was 2.5kg, and it was shelled at 50 seconds, the second portion also weighed 2.5kg, but it was shelled at 54 seconds. The third, fourth, and fifth sets were recorded following the same procedure.

G. Karthik,et.al., (2018)entitled “**DESIGN AND FABRICATION OF GROUNDNUT PODS AND SHELL STRIPPER,**” saidthat World is mostly concentrating on new inventions and running with updated technology. Farmers are the backboneof every country in the world. Without a farmer’s livelihood is difficult. Groundnuts are grown on a small scale by farmers. The major problem in groundnut production in countries like India is the lack of groundnut processing machines available to farmers. In the beginning, the peanuts were separated from their shells by the workers. The output from this method was very low and could not satisfy the market demand as it was a very time-consuming process. This project is mainly about removing the barriers while removing the groundnuts.

Methodology:-



Problem Identification

1. The traditional method causes injuries to the fingers of farm women.
2. This method also causes damage to the nuts which can then be used for oil expelling purposes.

3. There is a lot of time wasted in the old method of groundnut pod separating.

Collection of material

We collect the material DC motor, Battery, Chain drive, Shaft, cycle wheel, Speed controller, plywood, galvanized iron, and Switchboard to create a groundnut pod separating machine.

Fabrication of tool

Fabricate the equipment like a rectangular shape, using chain drive, DC motor, cycle wheel, and battery for making the machine.

Assembling

Galvanized iron is cut into rectangular shapes and the cycle wheel is fitted into the frame and covered by plywood. Upon the plywood, the switch is fixed into it. And switch is connected to the battery and to the motor which is connected with a chain drive along its shaft.

Testing

We test the weight and time efficiency of the groundnut pod separator with the manual method in the field.

Components And Their Properties

1. DC Motor.
2. Battery.
3. Chain Drive.
4. Cycle Wheel.
5. Shaft.
6. Speed Controller.
7. Switch Board.
8. Plywood.
9. Galvanized Iron.

DC Motor

Figure1:- Dc Motor.



A DC motor converts electrical energy into mechanical energy using direct current to produce rotational motion.

Battery

Figure2:- Battery.



A battery stores and supplies electrical energy through chemical reactions within its cells.

Chain Drive

Figure3:-Chain drive.



A chain drive transmits mechanical power between shafts using a chain and sprockets, providing a reliable and efficient means of motion transfer.

Cycle Wheel

Figure:4 Cycle Wheel



A cycle wheel provides support and rotational movement for a bicycle, enabling it to roll smoothly over surfaces.

Shaft

Figure5:- Shaft.



A shaft transmits rotational force and motion between different components in a mechanical system.

Speed controller

Figure6:- Speed Controller.



A speed controller regulates the velocity of a motor or machinery by adjusting the power input or signal to maintain desired performance.

Switch Board

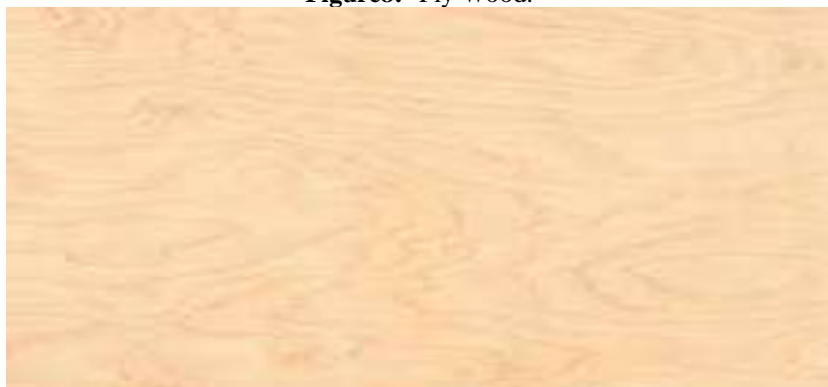
Figure7:- Switchboard.



A switchboard houses and organizes electrical switches, circuit breakers, and controls for managing electrical distribution and safety.

Plywood

Figure8:- Ply Wood.



Plywood is a versatile, engineered wood product made from layers of thin veneer glued together for strength and stability.

Galvanized Iron

Figure9:- Galvanized iron.

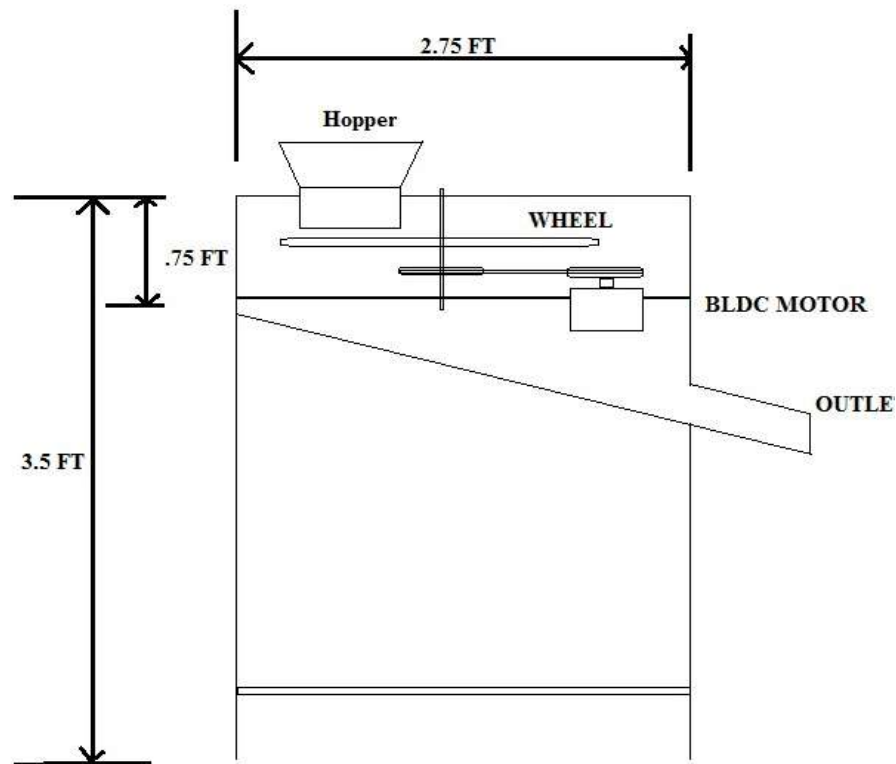


Galvanized iron is coated with zinc to prevent rust and corrosion, enhancing its durability for construction and industrial applications

Design And Fabrication Process

Design

Figure10:- Design for fabrication of groundnut pod separator.



Design is the process of creating a plan or specification for the construction or creation of something. It involves a variety of activities, such as researching, brainstorming, sketching, prototyping, and testing, to arrive at a final product or solution that meets specific objectives and requirements. The goal of design is to solve problems, improve functionality, and create a better user experience. Design plays a vital role in an evolving field that requires creativity, innovation, and adaptability to keep up with changing trends and technologies. Once initial ideas are formed, sketching and prototyping comes into play. Sketching allows designers to visually represent their concepts,

while prototyping involves creating tangible models or mock-ups to test and refine ideas. These prototypes are then subjected to testing and evaluation to identify any issues or areas for improvement. Feedback obtained from testing is used to iterate and refine the design further until a final product or solution is achieved.

Fabrication process

Fabrication refers to the process of manufacturing or building something, typically through the use of raw materials or pre-manufactured components. Fabrication can involve a wide range of techniques, tools, and processes, depending on the type of material being used and the desired end product. In industrial manufacturing, fabrication often involves the use of specialized machinery, such as lathes, milling machines, or CNC routers, to cut, shape, and join materials. This can include cutting and welding metal and forming composite materials. The goal of fabrication is to create a finished product that meets specific requirements in terms of functionality, durability, and aesthetics. Fabrication can involve a high level of precision and attention to detail, particularly when working with complex components or materials with specific properties.

Working Principle

Groundnut pod separator utilizing a DC motor, battery, and chain drive mechanism involves an intricate process to efficiently separate the nuts from the plant. The DC motor serves as the power source, drawing energy from the battery. This power is transferred through a chain drive system, which converts mechanical energy into rotational energy, and for the separation process, we are using the cycle wheel, which is covered by plywood in a rectangular shape. Upon the plywood, we are fixing the switches, that are connected to the battery and speed controller. Inside the frame, the shaft is connected to the chain drive, which is connected to the motor along the rotation of the chain drive the cycle wheel also rotates unidirectional for separating the nuts from the plant body. This method enhances the efficiency of the groundnut pod Separator, minimizing manual labor while maximizing output. The integration of the DC motor, battery, and chain drive showcases the synergy of mechanical and electrical principles, revolutionizing the agricultural sector with its automation and productivity.

Result And Discussion:-

Efficiency Testing

Our project's initial stage was centered around the design and Fabrication of a Groundnut pod Separator using techniques such as measuring, sawing, welding, DC Motors, and battery connection is successfully create a model. Our subsequent step is to test the functionality of the Groundnut pod Separator in the Field. We aim to observe its performance and efficiency to develop a cost-effective and time-saving mechanism that perfectly separates the nuts from the plant. To evaluate the efficiency of the Groundnut pod Separator, we test the Groundnut pod Separator in the Field. From these results, the manual method of harvesting for one hectare, 20 members is required. The total time duration of harvesting is 7 hours. By using a Groundnut pod Separator, for one hectare, 2 members are required. It will harvest in 3 hours. This indicates that the Groundnut pod Separator is significantly more efficient and productive compared to the manual method, as it can separate the nuts within 3 hours.

Efficiency

S. No	Method	Time taken for harvesting	No labors per Hectare(ha)
1.	Manual method	6-7 hrs.	20/ha
2.	Groundnut pod Separator	2-3 hrs.	2/ha

Conclusion:-

Our project is the design and fabrication of a ground-nut pod separator by assembling the materials such as a DC motor, shaft connected with chain drive, wheel, speed controller, battery, and switch successfully connected to create a model. Our subsequent step is to test the functionality of the ground-nut separator to determine its speed and efficiency. We aim to observe its performance and efficiency to develop a cost-effective and time-saving mechanism. To evaluate the efficiency of the ground-nut pod separator, we test the separator by inserting the ground-nut plant into it from the result. The manual method of picking requires 20 members per hectare and consumes 7 hrs. By using a Pod Separator, for 1 hectare, 2 members are required. It will separate in 2-3 hours, and its total cost is ₹10,000. This indicates that the Pod Separator is significantly more efficient and profitable compared to the manual method, as it can separate the pod from the plant within 3 hours.

Figure11:-Fabrication of ground-nut pod separator.**References:-**

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