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# DESIGN AND FABRICATION OF A BATTERY OPERATED GROUNDNUT STRIPPER

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**ABSTRACT**

*Agriculture is one of the most important sectors of Indian Economy. Today, India rank second world wide in agricultural field. Groundnut is one of the major agricultural crop in India. Lack of groundnut pod removing machines, especially groundnut pod strippers is a major problem of groundnut production, especially in our country India. In the recent condition the traditional manner of stripping groundnuts is manually by hands. The farmers simply decoct the groundnut by their hands and separate the pod from its roots. The output got from this method, was very low and it was very time consuming process. The focus of this paper is on design and development of ground stripper machine which will separate groundnuts from pods Our project is mainly focused on the design and development of a groundnut pod separating machine electrically powered by a battery operated motor. Some electric motor operated ground nut strippers are available but they are mainly AC motor operated which may not be useful where electricity is not available, so we have developed a battery operated portable stripper which can be easily transported to the farms wherever required.*

***Keywords:*** ***Agriculture, Groundnuts, Stripping, Design and Development, Battery operated stripper etc.***

## I.INTRODUCTION

Today India is ranking second worldwide in agricultural field. Many of the oilseeds used in Indian agriculture. Groundnuts or peanuts is the most important oilseed from that. A groundnut was first introduced into India by the Magellan expedition around 1519, as the opinion of Badami in 1936 years. The groundnut is one of the most important and the major oilseed crop in the world. It contains mainly 48-50% oil and 25.33% protein, 10.2% carbohydrate, 500-600 calorific value and 40.5% fat. Groundnuts are most powerful and important vitamin, almost wholly lacking in others.

Because of that, this product is cultivated in abundant quantity. There is so many time is west in traditional groundnut separating method. Normally the pod were separated from groundnut by the workers. They simply

decoct the groundnut by their hands and separate the pod from its roots. Generally the time required for 2 kg of groundnut separating from this groundnut pods is about 2-3 hrs, also lots of human efforts are required for this process. For that purpose to reduce human efforts & time we have developed a groundnut stripping machine which is a battery operated portable electric machine can be directly operated in the farm without a continuous electric supply.

## II. PROBLEM DEFINITION

1. Groundnut stripping is a time consuming process.
2. It requires more human efforts.
3. Necessity of large man force for a huge production of crops.
4. Increase in production and labour cost.
5. Very less earning gained by farmer.
6. Suitability of machine to operate without a continuous electric supply.

## III. OBJECTIVE/PROBLEM SOLUTION

Aim of our project is to design & develop a groundnut stripper which will help farmer to reduce human efforts and reduce cost of production of ground nut stripping. Which will be available to them at low cost.

1. To reduce labour efforts.
2. To increase profit.
3. To reduce time.
4. By using modern cultivation progress agriculture.
5. To reduce labour cost.
6. To achieve better efficiency or performance.

## IV. WORKING PRINCIPLE

In our machine stripping is done by holding the pod portion of a bunch over the rotor of the stripper. The vines along with the groundnuts are held over the rods of the rotor and the pods get removed. After pod removal, the bunch is dried and used as fodder for the animals. Though there are several models of groundnut pod stripper available in various research institutes, this machine is compact and portable which can be transported to the farms easily. By using electrical motor, the rotating moment transferred with the help of belt to the rotor. Rotor is like cage type structure which is mounted horizontally by means of pedestal bearing on two supporting member.

## V. CONSTRUCTION

The groundnut stripper consists of battery as a prime mover is to generate power, transmission elements such as belts, pulleys, supporting frame & bearings to hold the rotor of the stripper. Following elements are used in machine.

Motor –

The DC motor is direct current; there are permanent magnets on the outside and a spinning armature inside. It has high torque and load carrying capacity. It can be operated on battery supply while we use DC converter to allow a standard induction motor to be operated at any speed. Here we use a DC motor having 12 v supply and 1440 rpm and it requires 7.5 amps current.

V- Belt and pulley-

A pulley is a wheel which is mounting on an axel or shaft to transmit power by means of belt. V-belt pulley is used for power transmission. There are two pulleys used, one is at motor shaft and another is at drum shaft. Power is transmitted from motor shaft to the rotor of the stripper by V belt. Belt drive is one of the most common effective devices transmitting motion and power from one shaft to the other by means of thin inextensible belt over running over to pulleys.

Pedestal Bearing –

A Pillow block or Pedestal bearing is a supporting member of shaft. It is most common type of supporting device which helps to hold shaft. We use two pedestal bearings at the two ends of the rotor shaft to support it on the frame of the stripper.

Rotor –

Rotor is designed as like a cage type structure. It is made from 6mm bar as shown in figure. The two circular rings of M S material and of a diameter of 8 mm are prepared and these two rings are connected to each other by means of metal bars welded at a specific distance as shown in figure. Rotor is mounted on hollow pipe which is known as rotor shaft which is further connected to the frame through pedestal bearings.

Battery-

Main function of battery is to provide DC supply to the prime mover i.e. motor. We use battery of 12V DC supply having current rating of 10 amp.

## VI. DESIGN CALCULATIONS

### 6.1 Specifications of a groundnut

A single groundnut plant contains 20 to 30 groundnuts. On average,

Length of groundnut root = 30 mm

Length of groundnut = 20 mm

Width of groundnut = 10 mm

### 6.2 Calculation of required force

A research paper by J.M.Troeger, E.J.William and J.L.Butler the peg attachment force or the tensile force required to separate peg from pod is 22.26 N. Here we use up to ten ground nut plants so the maximum force that is required to remove groundnut pod is up to 300 N with considering the weight of shaft and other mountings.

Force, F = 300 N

### 6.2 Calculation of required torque

Torque, T = Force x Perpendicular distance

Perpendicular distance is the distance between the shaft axis and the rod of the rotor and it is 112.5 mm

Torque, T = 300 x 112.5 = 33750 Nmm.

Torque, T = 33.75 Nm.

### 6.4 Power calculation

Power, P = 2 π N T / 60

Speed required N = 100 rpm

P = (2 x π x 150 x 33.7) / 60

P = 484.26 W

P = 0.65 HP

Power required is 0.65 HP but for application we choose 1 HP.

### 6.5 Design of shaft

Torque , T = $\pi \tau$ d3 / 16

Allowable shear stress, $\tau$ = 42 N/mm2

Torque, T = (3.14 x 42 x d3) / 16

34.5 = (3.14 x 42 x d3) / 16

Diameter, d = 16.11 mm

The obtained shaft diameter is 16.11 mm. In order to do weld attachment on the shaft, diameter of the shaft is chosen to 25 mm.

Diameter of shaft, d = 25 mm.

Shaft length used, L = 740 mm

### 6.6 Selection of motor & pulleys:

Capacity of motor - 1 HP

Speed of motor – 670 rpm

Diameter of smaller pulley (Mounted on motor shaft) – 28 mm

Diameter of bigger pulley (Mounted on rotor shaft) – 55 mm

Speed at the rotor shaft – 341 rpm

### 6.7 Frame specifications

Length l = 640 mm

Breadth, b = 710 mm

Height, h = 650 mm

Floor space required (Area), A = 0.45 m2

## VII. FABRICATION

First a rotor is manufactured it consists of four metal rods of 6 diameter are welded to the metal ring of a diameter 8 mm. provision is made to mount the rings on the rotor shaft and fixed it on the shaft by using nut & bolts.

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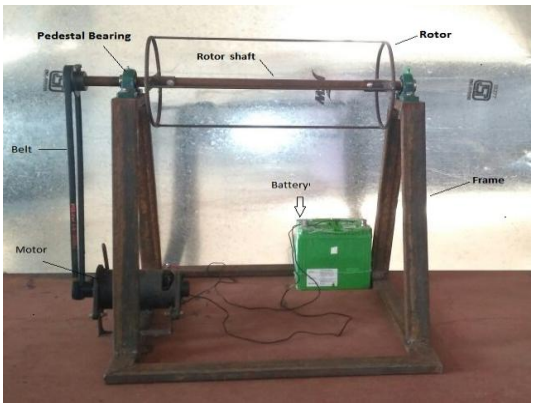


Fig. 1 actual model of ground nut stripper

The rotor shaft is supported in two pedestal bearings one at end and other at a distance of 590 mm from the other end. A bigger pulley is mounted at the other end of the rotor shaft. A supporting frame is the base of the structure supports all the components. It is manufactured from a box section of width mm and thickness mm. At the bottom of the frame a arrangement is done to mount the motor and battery. A smaller pulley is mounted on the motor shaft and a V belt is used to transmit the power from motor to the rotor.

## VII. WORKING

When the DC supply is given from the battery to the motor. It starts to rotate due to this pulley mounted on that motor shaft also rotates and power is transmitted motor shaft to the rotor shaft of with the help of V-Belt. Due to this rotor also start to rotate. Now when groundnut pod is held inside the rotor it cuts the groundnuts from the pods and groundnuts are collected at the bottom. A switch is provided for motor operation.

**Fig. 2 working of ground nut stripper**

## VIII. PERFORMANCE ANALYSIS

Based on the working of the groundnut stripper the following performance analyses were made. According to the analysis,

Number of labor required = 1

Cost of labor = Rs. 200/-

Collection of groundnuts per hour = About 35 to 40 kg

Total working time period once battery is fully charged = 6 hours

Collection of groundnuts per day(6 hours of working) = 35*6 = 210 kg

Cost of battery charging = Rs. 100/-

Total cost for stripping of 210 kg groundnuts = Rs. 300/-

No. of labors required for stripping 210 kg of groundnut by traditional method = 6 to 8

Cost of labor for stripping 300 kg groundnut by traditional method = Rs. 1200 to 1600/-

By this it is clear that using groundnut stripper is more economical and required less manual work. Now-a-days the climate is very hot and the labors find difficult to work in the farm and also it is difficult to get workers in most of the areas. So this machine will help the farmers to harvest with minimum time and money.

## VIII. CONCLUSION

The portable groundnut stripper will help to improve stripping efficiency of large scale production of groundnuts. It also helps to reduce human effort. The groundnut stripper is useful for farmer in stripping of groundnuts pods in most convenient methods with time and cost efficient. Requirement of more number of workers will be eliminated as only one worker can carry out the complete threshing operation. The main importance of this project is as this machine is battery operated it can be directly transported to the groundnut farms and can be operate without an external electric supply which is not available at most of the farms. The weight of the machine is low it is handy to use and easy to move anywhere at the farms. Also its cost is low and affordable for the farmers.

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