

Banana Fiber Extracting Machine

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Abstract: The basic aim of this paper is to design and develop the process to extract the banana fiber from banana stem. With the help of manual extraction of banana fiber, we can produce good quality of fiber but it is much time consuming. Labour charge is high and output is low. So that efficient extraction of banana fiber can only be possible through mechanization. Now a day's machines exist for extracting banana fiber but are manually operated and cannot be applied for mass production. The efficiency of existing machine is average. It is time consuming and unsafe process. This project is specially designed for extracting banana fiber from the banana stem. The designed of machine is very simple and can be used by unskilled person due to its simplicity. The major components used are decorticator, blade, belt and pulley, motor, and roller shaft etc.

Keywords: Banana Fiber, Extraction machine, Fiber property, Banana extraction.

I. INTRODUCTION

Banana fiber is ecofriendly like another natural fiber. It has huge export demand from many other countries like Japan, Australia, Germany etc. Fiber can be obtained from whole banana plant. After the fruit is obtained, the plant is thrown away giving rise to increase in waste. The proper disposal of this plant is another problem. By using a good fiber extractor machine, a large amount of fiber can be obtained which will give additional income to the Farmer. Fiber is extracted from the pseudo stem of the banana plant the use of Banana fiber for textile and other purpose as natural materials a new concept for India. In the past, banana fiber had a very limited application and was primarily used for making items like ropes, mats and some materials. With the increasing environmental awareness and growing importance of unfriendly fabrics, banana fiber has also been recognized for all its good qualities and now its application is increasing in other fields too such as apparel garments and home furnishings. The natural fiber is renewable, non-abrasive, bio-degradable entity. It offers good calorific value and exhibit excellent mechanical properties and is inexpensive. The traditional process such as the retting method to extract plantain fibers involved the anaerobic and biological organism presence in the medium where the pseudo stems were stored in order to decompose the lignin, pectin and other substances. However, the traditional methods of plantain fibre extraction (retting) require about 2–6 weeks decomposing the non-fibrous constituent of the pseudo stem before further modification could be done to obtain the fibers. Hence, the purpose of this study is to develop and fabricate an electrically powered banana fiber extraction machine.

II. AIM & OBJECTIVE

The basic aim of this paper is to study and know the research gap between the use of traditional method and the mechanized extraction for banana fiber in India, along with the parameters related to the existing extraction. In India very few people are aware about different existing extractor, their benefits and requirements in order to achieve higher productivity. Hence, we aim to study about fiber extraction, their benefits and requirements and help to popularize it among the people especially small-scale farmer in our country so as to minimize cost of production and have better quality banana fiber. Use of banana fiber extraction also generates an alternate source of income for farmers.

III. LITERATURE REVIEW

Banana has long been considered a food, fruit and fodder crop. In addition to this, now a day, it is also gaining importance as a source of fibers. India is the largest producer of banana in the world with an estimated annual output of 13.5 million tons, of which 80% is generated from six states, namely, Tamilnadu, Maharashtra, Karnataka, Kerala Andhra Pradesh and Gujarat. Annually about 1.5 million tons of dry banana fibers can be produced from the outer sheath of pseudo stem. With the increasing demand for banana in both the Indian and International markets, the acreage and production are expected to increase in the coming years, thus generating more of the Pseudo stem biomass waste. Being a rich source of

natural fibers, the pseudo stem can be profitably utilized for numerous applications and preparation of various products. Thus, in order to get acquainted with the earlier reported details of banana fiber production and utilization and blending possibilities, an extensive literature review was carried out. In order to have a clear picture of the banana fiber utilization the literature collected has been further classified under three categories. This consists of studies related to banana fibers and its applications.

Sinha (1973) [169] studied on the use of banana plant fiber as a substitute for Jute. Banana-plant fiber is strong, soft, and coarse and technique developed for processing the fiber on standard jute machinery is reported. In some trials the banana fiber was also blended with Mesta (cellulosic fiber). The banana 82 fiber spin ability and weaving performance were investigated, so that it can be used as a good substitute for jute in making of sacks and packaging materials. The yarn composed of entirely of banana fiber can replace jute on weft, sacking warp yarn and still maintain the standard cloth characteristic of Banana.

IV.COMPONENTS

- 1) Motor
- 2) Frame
- 3) Roller
- 4) Bearing
- 5) Pulley
- 6) Decorticator
- 7) Nut- Bolt
- 8) Belt

V.CONSTRUCTION

1. **Motor:** An electric motor is a machine which converts electrical energy to mechanical energy. It is used to transmit the power to the rotor.

Specification:

Power	1HP, 746W
Speed	1440 RPM
Phase	Single Phase
Voltage	220 Volt



2. **Frame:** This is made of mild steel and sheet metal material. The whole parts are mounted on this frame structure.



3. Roller: Roller is the most important element in this machine. There are two fixed rollers for feeding and another one is rotating roller.



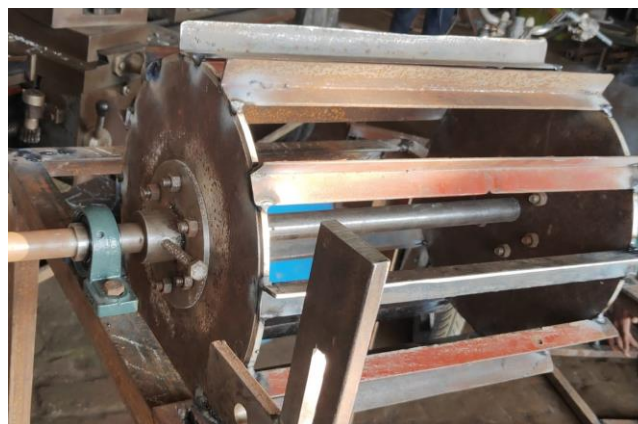
4. Bearing: A bearing is a device that supports moving parts and allows them to move more smoothly by reducing friction.



5. Pulley: The pulley is mounted on the shaft. A fixed pulley changes the direction of the force on belt that moves along its circumference.



6. Decorticator: The decorticator is made by welding metal stringers of 20 x 3 mm over two circular plates. The diameter of decorticator is 300 mm and its length is 400 mm. Also, a shaft of 25 mm is welded concentric the decorticator.



7. **Nut-Bolt:** Nut and bolt is use for temporary joining of two different parts. A nut is a small metal object with a hole in the middle that has a corrugated.

Steps in banana fiber production



8. **Belt:** Belt is used to transmit the motion from the driver pulley mounted on motor shaft to the driven pulley mounted on decorticator shaft.



VI. WORKING

The working of banana fiber extracting machine is very simple and easy. This is comparatively simple when compared to the previous model. It is weight less one and have an easy feeding process.it consists of two fixed rollers for feeding and a one rotating roller. Other than this, it consists of two pulleys, two bearing, one shaft, supports and casing. It is simple machine consisting of single roller which rolls on fixed support. 1hp motor is used to provide input power to machine. The machine reduces labor work and increases fiber production by 18-24 times as compared to normal machine. The motor starts and rotate the driver pulley and power is transmitted to the driven pulley through the power transmission by belt. After, it rotates the roller. Now the sized stem is feed through the two rollers. The machine is constructed with a ac motor to rotate, attached with a rotating shaft and this is coupled with blades. When the banana stem is pushed into the fiber extractor with the help of two rotating shaft, when the banana stem is inserted into the extractor the blade which rotates with the help of motor it continuously rotates and shattered the banana stem and extracts fiber. After shattering banana stem in the working area by using the blade attached with motor shaft after the process finished then banana fiber is carried out in the extractor. The fiber is then used for industries.

VII.CALCULATION**1. Length of Open Belt Drive**

Length of belt drive can be obtained as;

$$l = \pi(r_2 + r_1) + 2x + (r_2 - r_1)^2/x$$
$$l = \pi(38 + 114) + 2 \times 406 + (38 - 114)^2/440$$
$$l = 1303.48\text{mm}$$

Where, r_1 and r_2 = Radius of the larger and smaller pulleys, respectively x = Distance between the center of two pulleys required.

2. Velocity Ratio of Belt Drive

The velocity ratio of belt drive can be expressed as;

$$N_2/N_1 = D_1/D_2$$
$$N_2/N_1 = 76/228.6 = 0.33$$

Where: D_1 is the Diameter of the driver; D_2 is the Diameter of the follower, N_1 is the Speed of the driver in rpm and N_2 is the Speed of the follower in revolution per minute (rpm).

3. Velocity of Belt Drive

The velocity of belt drive can be expressed as;

$$V = \pi D_1 N_1 / 60$$
$$V = \pi 76.2 \times 1440 / 60$$
$$V = 5.779\text{m/s}$$

Where, $N=1440$ rpm (from motor) and V =velocity of belt drive.

VIII.BENEFITS OF BANANA FIBER EXTRACTOR MACHINE

1. Efficient utilization of resources by saving Labour & cost of overall production
2. Higher productivity compared to traditional methods.
3. Produces 15-20 kg of fiber in 8 hours.
4. It consumes 0.75 units every hour which is very less.
5. The length gives the best quality fibers as far as length non-abrasiveness.
6. Mainly low support, simple to work, and safe.
7. Clean workplace.

IX.CONCLUSION

The new banana fiber extraction machine can be designed with higher efficiency. This machine will reduce manual work and is suitable for mass production. Compact structure and easy disassembling will be another advantage. The problem of impurities and knots can be solved with this kind of design. The factors affecting quality of fiber are roller speed, feed angle and clearance also affect the production quantity of fiber. By choosing these factors correctly, quality and production of fiber can be increased. The project carried out by us made an impressive task in fiber industries. It is very useful for the workers. This project has also reduced the cost involved in the concern.

Acknowledgment

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