Design of Muskmelon Seed Peeling machine

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Abstract A manually operated muskmelon seed peeling machine design was developed and evaluated in this study. The design was optimized to fabricate and to handle it easy. It consists of a hopper, the shelling chamber and an outlet unit. The developed muskmelon seed peeling machine is expected to shelling performance accounting for an optimal throughput capacity of about 93% and shelling damage rate of 7% at seed moisture content of 18.38%. By theoretical performance evaluation the machine can efficiently shell muskmelon seed. These muskmelon seed peeling machine technology can effectively take care of the challenges posed by erratic power supply and the high cost of gasoline. It providing support for small and medium scale farmers and food processor and at the same time make available quality melon seeds at low cost. The machine is semi-automatic in operation. Future scope for developing the machine is to make it to function fully automatic starting from automatic feeding up to self-hygienic packing.

Keyword: Design, Muskmelon Seed, hopper, wooden roller

1. Introduction
Muskmelon is a species of melon that has been developed into many cultivation varieties. These include smooth skinned variants and seeds. The origin of muskmelon is unknown. Research has recorded that seeds and root stocks were among the goods traded along the coriamen routes of the ancient world. Muskmelon seed have numerous benefits for skin. Muskmelon seed reduces risk of kidney diseases. Melon seed contain phytonutrient, potassium, vitamin A, vitamin C, vitamin E, vitamin K, folic acid etc. The need of the melon seed in our life is simultaneously increasing day by day. But the peeling operations were done using manual methods like the use of cob with ears of corns, the use of mortar and pestle, etc. Manual processing of agriculture material is the consuming and tedious. The
muskmelon seed peeling machine reduces the time taken for peeling the seeds and also reduces the seed damage during peeling and be helped for farming. As the muskmelon seed is having a high demand in the market because of their high medicinal and enriched in protein and vitamins. Usually the muskmelon seeds are semi dried before peeling in a shadow atmosphere. With reduced moisture content the seeds are peeled local farmers with manual effort. [1]Because of their small size it’s difficult to peel the seeds. The silky outer structure of the seed is raising the problem to be handling. It takes much effort for the farmers to peel the seeds to value add the product [2]. In this study a design is developed to peel the muskmelon seeds easily. The compactness of the machine made it to be portable. This design of seed peeler machine will overcome the problems faced by the farmers by the conventional hand peeling technique. This machine can be operated to run manual by rotating a handle or in automatic by coupling it with a power source like small engine or electric motor. The effectiveness of De hulling the seeds of sunflower is a function of characteristic of seed like size, shape, moisture content and of operating conditions like feed rate and impeller speed [4]. The unthrushed seeds rate is higher with increased feed rate and decreased with decreasing the speed of the crushing cylinder [5]. Hence the muskmelon seed peeling machine is designed to operate with a constant feed rate. Visible grain damage increased with an increase in threshing drum speed and feed rate for each threshing drum. The minimum specific energy consumption could be achieved with the rasp bar drum at all speeds and feed rates [7] Shell nut cracker operates on the principle of impact using centrifugal force from a spinning disc. Results of performance tests showed that moisture content affected the performance indicators (percentage effective cracking, percentage breakage, percentage of partially cracked nuts, and percentage of uncracked nuts [8]. From the literature it is clear that preprocessing the seeds is an important performance deciding factor to attain required efficiency of the machine. The performance was evaluated in terms of output threshing efficiency, separation efficiency, percentage of seed losses and damage seed.[9]. The design of muskmelon seed peeling machine aims at to reduce the losses by reducing the damage to the seeds and un peeled seeds after operation. Fracture mechanism was based on the deformation characteristics of dried dika nut under uni-axial compression. When actuated, the slider compresses the nutshell to failure along its line of symmetry [10]. The objective of the paper is to design the muskmelon seed peeling machine as manually operated and easy to use.

2. Design of seed peeling machine

The Muskmelon Seed Peeling Machine is unique machine. It is special design for the agricultural process and for high yield Production. The peeling machine operated and work process of quick easily handles it. The major components of the machine are the frame, hopper, decorticating chamber, concave sieve, rotating blades, discharge outlet and a vibrating separator with sieve to separate seed and shell [11]. The investment cost of the machine is less and the parts are easily available in market. Depends on the Production and rate of operations performance the machine can be alternated easily. The possibilities are lesser to getting defects in this machine. The machine is designed with easily available parts and with less amount of friction. It can be operated by unskilled workers also. In case of any defects raised in the machine it can be easily service by unskilled workers also. It is compact in size and can easily transform from one place to other place. Power consumption of the machine is less and less friction in nature. The durability strength of machine is high. It can operated in both AC and DC power supply. Frictional components are lesser in this machine. Special type of seed filters are used to control the feed rate.
It has adjustable roller pairs to control and reduce seed damage. The roller and other components are designed by skilled engineers. So it is easy to operate by unskilled workers also. The case body of the machine has different patterns for different purposes. It has different size of rollers with different patterns according to its feed rate. It has specially designed hub to collect the peeled grains. It uses pulley with belt drive to get power from the motor. Lesser HP motor is enough to drive this machine, because the movable parts are lesser in this machine. Figure 1, 2 shows the front and side view of seed peeling machine. Figure 3 shows the 3 D view of seed peeling machine.

3. Experimental Setup

The utility model relates to a muskmelon seed peeling machine, which is characterized in that a pair of rollers are arranged inside a case body. The case body is a specially designed component which has different type of pattern over it is surface. A motor and a pulley which is connected with the help of belt drive and which supplies power to the rollers over the case body. The connecting rods connect both the case bodies for supporting each other to safeguard the components and avoid accidents. The seed filter and the hopper are connected together and placed over the roller surface; the case body supports both the hopper and the seed filter. The seed filter is unique and specially designed component of this machine which having unique pattern.
3.1 **Hopper**
Hopper is used to feed the seeds into the machine which has a broad area at top and narrow at bottom so as to facilitate the feeding of seeds into the machine evenly. Figure 4 shows the front, side and top view of hopper. It is made up of steel drum with conical shape to avoid spillage of seeds during feeding.

3.2 **Rollers**
Rollers made of wood are used to crush the seeds so that seeds are peeled easily with minimum damage. Dry hard wood is machined perfectly which maintains a gap of 4 mm between the rollers to ensure the proper peeling of muskmelon seeds. Figure 5 shows the top view of rollers with sharp edges made by grooving at regular intervals.
3.3 **Filter**
Filter made of steel mesh is used to avoid the entry of unwanted materials also ensure the seeding process evenly by allowing entry of seed one at a time in the filter. Any solid waste like small stones and dried sand particles are not allowed to enter inside the roller which affect the efficiency of the machine. Figure 6 shows the filter top view along with feeding mechanism.

![Figure 5 Wooden rollers](image1)

**Figure 5 Wooden rollers**

![Figure 6 Filter](image2)

**Figure 6 Filter**

4. **Work Methodology**
A muskmelon seed peeling machine is quite different from other peeling machine. The working mechanism and the feeding unit of this machine are unique and simple. It has specially designed hub for collect the peeled grains. It uses motor as a power source to drive the machine unit; it gets rotary force from the motor and drive the machine. The different components of the machine are supported by the case bodies and both the case bodies are getting contact with the help of connecting rods. The pulley system gets the power from the motor with the help of the belt drive to rotate the roller, the gears transmits the power from one rollers to the other roller to rotate simultaneously one each other. The seed are feuded into the machine with the help of hopper. The seed filter is used to controlling the feed rate of the melon seed over the rollers. The peeled grains are separated and collected into the hub. The case body avoids the accidents while operating the machine, and are also avoids the damages occurring while peeling. This machine applies centrifugal force in achieved shelling/peeling. The hub is located under the setup to collect the peeled grains after peeling and the hub are also supported by the case body. Gears are connected at one end of the roller to transmit power from one another to rotate simultaneously. Pulley is connected at the other
end of the roller to get power from the motor. The rollers and seed filter are hide by the cover plate at both sides of the machine to avoid accidents. The motor is located at the one side of machine where the pulley is present. The motor is clamped together with the machine and gets power from outsource, these motor workers on both the AC and DC power supply. Materials of adequate strength and stability were considered in the research design. The machine was designed to have maximum capacity of 20kg of melon per batch so that machine could be affordable for small scale farmers. The materials that are considered in carrying out the research design are locally with available best materials. Consideration was given to the cost of items and materials for the ultimate aim of utilizing the cheapest available materials, yet satisfying all strength requirements.

5. Conclusion
Seed peeling process have been identified as post-harvest operations which improve the quality and value of agricultural material for muskmelon seeds. The principles of operation peeling machine were reported to be dependent on their engineering properties. In this present work the design is simplified to manufacture and to operate the machine in an easy manner as this machine should be operated also by unskilled labors. An increased performance of peeling of seeds is achieved with lesser fatigue when compared to hand peeling. The output rate can be increased with increasing the capacity of the machine. From the above design it is expected to obtain a large quantity of seeds can be peeled with lesser fatigue than conventional hand peeling technique. The Efficiency of the machine is increased by maintaining the moisture content of the seeds. The feed rate of the machine is maintained by the filter element which allows one seed at a time after filtering the unwanted waste. As the machine is powered by motor, it is utilized to peel the seeds in bulk quantity. The spillage of the peeled seeds is avoided by the collecting bag which is attached at the outlet of the roller. The design of seed peeling machine is portable, easy to handle, easy to maintain and aims to produce higher efficiency with lesser damage to seeds.

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