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Development of Table-Top Shallot Peeler Cum Cutting Machine

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Abstract: This study presents the design and development of a compact table-top shallot peeling and cutting machine utilizing a camshaft-driven mechanical system. The proposed mechanism integrates abrasive peeling and precision cutting operations within a single unit to improve efficiency and reduce manual labor in small to medium-scale food processing environments. The peeling system features a stationary drum equipped with an emery-coated disc (Carborundum Q297) that rotates at 140 RPM, effectively removing the shallot skin through abrasive friction. A camshaft mechanism is employed to synchronize the motion of internal components, ensuring consistent contact and minimal shallot damage. Following the peeling process, high-carbon steel cutting blades are used to chop the shallots into desired sizes. The machine aims to optimize processing time, reduce operational complexity, and maintain the quality and hygiene of the end product. Experimental trials demonstrate promising results in terms of peeling efficiency, minimal wastage, and uniform chopping. This mechanized solution offers a significant advancement for small-scale food processing applications.
Keywords: Shallot peeling, Cutting mechanism, Peeling efficiency,Abrasive Peeling, Camshaft Method.

I. INTRODUCTION

Shallots are an essential culinary ingredient used globally for their distinctive flavor, aroma, and health benefits. Despite their relatively small size compared to other members of the Allium family, such as onions and garlic, shallots pose a significant challenge during manual processing due to their tight, layered skin and intricate structure. In the food processing industry, and particularly in small to medium-scale catering businesses and commercial kitchens, peeling and cutting shallots is both labor-intensive and time-consuming. The development of a compact, efficient, and user-friendly solution to automate this process has become a necessity to improve productivity, reduce labor costs, and ensure hygiene and uniformity in food preparation.Manual peeling of shallots often results in considerable wastage due to the removal of edible layers along with the outer skin. Moreover, prolonged exposure to the sulphur compounds released during peeling and cutting can cause eye irritation and discomfort to workers. These challenges are amplified in high-volume kitchens and small-scale food processing units where manual processing is still prevalent. The need for a solution that can simultaneously peel and cut shallots efficiently, without compromising the quality of the produce, is more pressing than ever.Several machines have been developed for peeling and cutting onions, garlic, and other similar produce, but most of these are either industrial-scale machines with high capacity, requiring large space and capital investment, or lack the ability to handle shallots effectively due to their smaller size and delicate structure. Existing tabletop devices often address only one aspect—either peeling or cutting—necessitating multiple devices and manual handling in between processes. This not only increases operational time but also introduces a greater risk of contamination.In response to these limitations, this research focuses on the design and development of a tabletop shallot peeling cum cutting machine that is specifically tailored to the characteristics of shallots. The proposed machine aims to integrate the peeling and cutting operations into a single, compact unit suitable for small-scale food processors, commercial kitchens, and even household use. Key design considerations include size adaptability, minimal damage to the shallots during processing, ease of maintenance, energy efficiency, and user safety.The development process includes a thorough analysis of existing peeling and cutting technologies, identification of suitable materials and mechanisms, prototyping, and performance evaluation under various operational parameters.This machine not only promises to enhance the speed and efficiency of shallot processing but also contributes to improved hygiene, reduced physical strain on workers, and increased consistency in output. By addressing both functional and practical limitations of current solutions, the tabletop shallot peeling cum cutting machine stands to significantly benefit food service operations and pave the way for further innovation in small-scale food processing equipment.The following sections of this paper outline the detailed design methodology, component specifications, fabrication process, testing procedures, and performance analysis of the developed machine. The results demonstrate the potential for scalable application and future improvements to accommodate similar produce.

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The increasing demand for processed vegetables in both domestic and commercial kitchens has necessitated the development of small-scale, efficient, and user-friendly food processing equipment. Among these, the shallot – a commonly used culinary ingredient known for its flavor-enhancing properties – presents unique challenges in post-harvest processing due to its size, clustered growth habit, and thin, tightly adhering skin. Traditionally, shallots are peeled and cut manually, a method that is not only time-consuming and labor-intensive but also leads to inconsistent output and high labor costs. Furthermore, manual handling exposes workers to the pungent sulphur compounds released during peeling and cutting, often resulting in eye and skin irritation. In light of these challenges, the development of a compact, multifunctional tabletop shallot peeling cum cutting machine represents a timely and practical innovation for small restaurants, catering businesses, and household use.The conceptualization of a tabletop machine necessitates the integration of two primary processes – peeling and cutting – into a single compact unit. This dual-function design aims to reduce the overall footprint of the equipment, making it suitable for kitchen countertops or small food-processing setups. The design must also prioritize simplicity, safety, ease of cleaning, and cost-effectiveness, which are critical for adoption among small-scale users. The engineering focus, therefore, lies in combining efficient peeling and cutting mechanisms that can handle the delicate nature of shallots without significant damage or loss.The peeling mechanism is one of the most critical components of the system. Unlike onions, shallots are smaller and often appear in clustered bulbs, making them more challenging to peel without damage. Various peeling methods such as abrasive, pneumatic (air jet), chemical, thermal, and mechanical blade systems were evaluated during the design process. Among these, abrasive peeling combined with mild airflow emerged as the most viable solution for a tabletop model due to its simplicity and ability to function without complex pneumatic systems. The peeling chamber typically consists of a cylindrical or drum-type abrasive surface that gently agitates the shallots, loosening the outer skin. Simultaneously, a small air blower facilitates the removal of loosened skin by directing airflow through strategically placed vents. This dual action enhances the efficiency of the peeling process while minimizing physical damage to the bulb.Key design considerations include the abrasive material selection, chamber speed (RPM), duration of peeling, and airflow rate. Too much abrasion can lead to the removal of shallot flesh, while insufficient abrasion results in incomplete peeling. An optimal balance must be achieved through prototyping and iterative testing. Furthermore, the loading capacity of the chamber is also limited to ensure uniform contact and avoid overcrowding, which could result in inefficient peeling and jamming of the mechanism. A batch capacity of 500–700 grams per cycle is considered ideal for a small tabletop unit catering to household or small business needs.Once the shallots are peeled, the next integrated process is cutting. The cutting mechanism must accommodate the natural irregularity in shape and size of shallots while ensuring uniform slices or segments as per user requirements. A rotary disc or reciprocating blade system is typically considered for cutting applications. In the proposed design, a rotary cutter with stainless steel blades is mounted at the exit of the peeling chamber. As the shallots are discharged post-peeling, a feeder mechanism guides them into the cutting zone. Depending on the desired cut – slices, dices, or halves – interchangeable blade assemblies can be provided. The cutting unit must be shielded and equipped with safety locks to prevent accidental contact with blades during operation or cleaning.Synchronization between peeling and cutting processes is vital to ensure continuous flow and minimize manual intervention. This can be achieved through a timed control system or sensor-based automation where the peeling chamber only allows discharge once a predefined time or peel quality threshold is reached. A simple microcontroller such as an Arduino or a programmable timer circuit can govern this operation. Power requirements are kept minimal (typically under 250 watts), making the machine operable through standard kitchen power outlets.The construction materials for the machine are selected with hygiene, durability, and food safety in mind. Food-grade stainless steel (SS304) is used for all parts in contact with the shallots, while the external casing may use ABS plastic or coated mild steel for cost control. The design also incorporates a transparent cover or inspection window for user monitoring and aesthetic appeal. Ventilation is provided to prevent motor overheating, and all electrical components are insulated to meet safety standards. The machine should also be modular in construction, allowing easy disassembly of the peeling and cutting units for maintenance or cleaning.In terms of user interface, the tabletop shallot peeling cum cutting machine can be equipped with a simple control panel featuring start/stop buttons, a timer dial, and safety indicators. Advanced versions could include digital displays, touch controls, and programmable settings for different shallot sizes or cut types. Additionally, noise and vibration dampening measures are implemented to make the unit suitable for domestic use. Rubber feet, internal padding, and balanced rotating components help reduce operational noise.During the prototype testing phase, several parameters such as peeling efficiency (% of skin removed), cutting accuracy (uniformity and completeness), cycle time per batch, power consumption, and damage rate (percentage of shallots bruised or broken) are evaluated. User feedback on ease of use, safety, and maintenance also plays a significant role in refining the design. The goal is to achieve over 90% peeling efficiency and a damage rate below 5%, which are considered acceptable standards for a domestic or small-commercial food processor.In conclusion, the development of a tabletop shallot peeling cum cutting machine addresses a significant gap in the existing food processing equipment landscape, particularly for small-scale operations.

II. METHODOLOGY

The machine was developed and carried out with the aim of peeling the shallots without any damage and also including the cutting process simultaneously especially in small-scale food processing units, households, catering startups and restaurant settings. The machine was designed to be compact, easy to operate and also energy efficient, while ensuring a clean and consistent output.

A. Material selection:

The material was selected on durability, cost-effectiveness, and food safety. The main materials used includes the food-grade stainless steel for peeling chamber and cutting blades. The motor used was AC motor with the speed of 140 rpm for rotating mechanism. The abrasion-based peeling method specifically emery cloth carborundum Q297 were used for effective peeling.

B. Operational Mechanism:

1) AC Motor: The machine is powered by an AC motor that drives the peeling process. This motor provides consistent and adjustable speed, allowing for optimized peeling efficiency based on the size and condition of the shallots.
2) Abrasive Peeling Method: The peeling action is achieved through abrasive surfaces that rub against the shallots as they are fed into the machine. These surfaces can be made of materials like rubber or specialized abrasive coatings that effectively remove the outer skin without damaging the flesh.
3) Centrifugal Force: As the shallots are fed into the machine, the motor spins a drum or chamber at high speeds. This generates centrifugal force, which propels the shallots against the abrasive surfaces, enhancing the peeling process. The force ensures that the shallots are uniformly peeled as they are rotated.
4) Speed Control Settings: The machine includes speed control settings, allowing users to adjust the motor's RPM (revolutions per minute).

C. Materials used:

Figure 1:
Motor Pulley.

Figure 2 :
Casting components

Figure 3:
Rotating disc.

Figure 4
Stainless Dru

Figure 5:
Metal steel frame.

Figure 6:
Shaft.

Figure 7:
Steel bush & pipe pock.

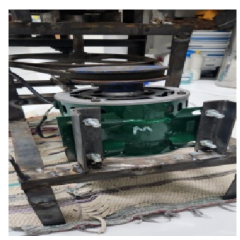

Figure 8:
AC motor

1) Metal Steel Frame: The frame serves as the backbone of the machine, providing a stable base to support all other components. Its strength ensures that the machine can withstand vibrations and operational forces, which enhances its durability over time.
2) Stainless Steel Drum and Disc: These components are critical for the peeling process. The stainless-steel material is not only resistant to rust and corrosion but also easy to clean, which is essential for maintaining hygiene when handling food products. The drum houses the shallots during peeling, while the disc works in tandem with the drum.
3) Shaft: The shaft is a cylindrical rod that connects the motor to the drum. It transmits rotational energy, ensuring the drum and disc rotate effectively. Its design must handle torsional forces without bending or breaking.

4) Steel Bush: This component is typically fitted around the shaft and helps reduce friction between the rotating parts. It acts as a bearing surface that minimizes wear and tear, extending the lifespan of the machine.
5) Steel Pipe Pocket: This pocket houses components such as the shaft and provides structural support. It plays a role in maintaining the alignment of moving parts, which is crucial for the machine's operational efficiency.
6) Bearing Cups: These are essential for allowing smooth rotation of the shaft within the machine. They reduce friction and wear, enabling the machine to operate quietly and efficiently.
7) Motor (140 rpm): The motor is the powerhouse of the machine, converting electrical energy into mechanical energy. A 140rpm speed motor is commonly used in many regions, providing sufficient power for peeling operations while ensuring compatibility with standard electrical systems.
8) Abrasive Surfaces: The surfaces inside the drum are designed to effectively strip the skins off shallots. The abrasiveness is critical, as it helps to mechanically remove the outer layer without damaging the shallots themselves.
9) Cast Iron Motor Pulley: The pulley connects the motor to the shaft, facilitating power transmission. Cast iron is chosen for its strength and durability, ensuring that the pulley can handle the load without deformation.
10) Disc: This component plays a crucial role in the peeling process, working alongside the drum to help dislodge the skin from the shallots. Its design is optimized for effective contact with the abrasive surfaces.
11) Casting Components (Fasteners and Threads): These components secure various parts of the machine together. Using high-quality fasteners ensures that all parts remain tightly assembled, which is important for safety and efficiency during operation.
12) Drum Door: The drum door allows for easy access to the interior of the drum, making it convenient to load and unload shallots. Its design ensures a tight seal during operation to maintain efficiency and prevent spillage.

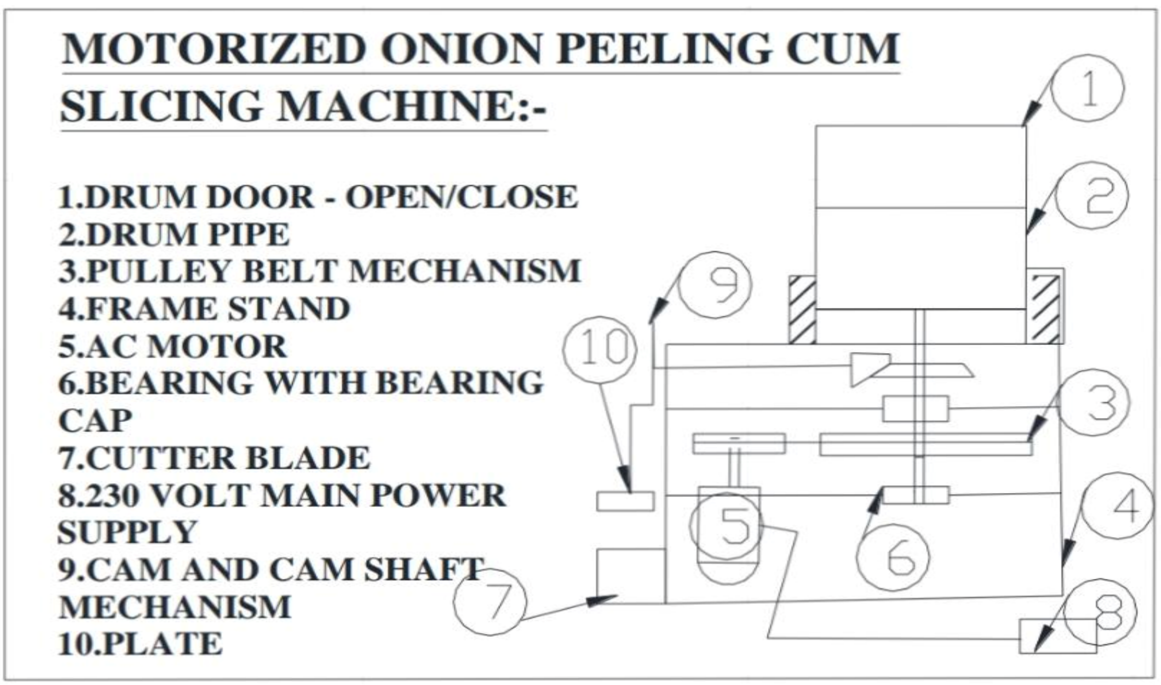

Figure 9: 2D diagram of the developed shallot peeling cum cutting machine

D. Peeling Mechanism:

The peeling system was designed based on abrasion principles. Shallots are fed into a rotating drum lined with disc rotation and rough surfaces. As the drum rotates, the outer skin of shallots are removed through mechanical abrasion method.

E. Cutting Mechanism:

After peeling, the shallots are transferred into the cutting chamber through camshaft method. The cutting blades are used to chop the shallots into pieces. The cutting unit consists of rectangular shaped blade with outer cover fixed in the base.

Figure 10: front view of the developed Machine. Figure 11: top view of the developed. Machine.

Trial Taken:

Figure 12: Initial weight-500g

Figure 13: after 1 min

Figure 14: after 2 mins

Figure 15: after 3 mins

In initial stage the shallots are fed into the peeling drum chamber, for each minute the sample was tested accordingly whether the peels are removed fully. After 3 minutes of peeling the shallot peel are entirely removed. The peel waste and shallots are collected together in the drum, to remove the peel shallots are cleaned with the water and also the corner heads are removed manually (if needed the corner heads can be removed manually before the shallots fed into the peeling chamber). Then the shallots are taken to check the final weight of the sample and determine the peeling efficiency. After peeling the shallots are kept in the cutting phase to cut into pieces with the help of blades.

Figure 16: After peeling without Removal of shallots

Figure 17: The peel waste is removing y water cleaning method

Figure 18: After removal of waste peel

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TRIAL 2:

In initial stage the shallots are fed into the peeling drum chamber, for each minute the sample was tested accordingly whether the peels are removed fully. In second trials, the head and corner of the shallots are removed manually. After 2 minutes of peeling the shallot peel are entirely removed. The peel waste and shallots are collected together in the drum, to remove the peel shallots are cleaned with the water and also the corner heads are removed manually. Then the shallots are taken to check the final weight of the sample and determine the peeling efficiency. After peeling the shallots are kept in the cutting phase to cut into pieces with the help of blades.

Figure 19: After peeling without Removal

Figure 20: The cleaned shallots are in the water

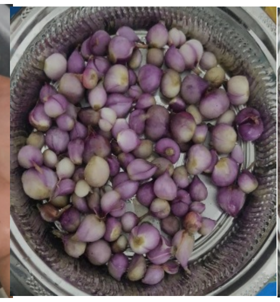


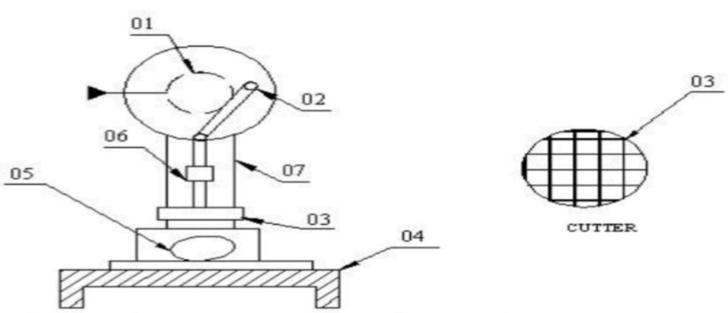
Figure 21: After cleaning and removal of dirt

Figure 22: After removal of waste peel

After 120 seconds(2 minutes) the shallot was completely peeled and the waste peel removed by cleaning the peeled shallots with water to remove the waste peel and dirt. As a result, and the hard root end are removed manually and the shallots are peeled accordingly in the machine. The 500 g of sample had been taken and it results 394 g of peeled shallots after cleaning. Peeled shallots(%) is around 77.8% and the loss(%) is 22.2%.

F. Cutting Mechanism:

After peeling, the shallots are transferred into the cutting chamber through camshaft method. The cutting blades are used to chop the shallots into pieces. The cutting unit consists of rectangular shaped blade with outer cover fixed in the base.In this setup, a rotating cam converts continuous rotary motion from a motor into a reciprocating vertical motion of a plunger. Each cam lobe lifts the plunger; as the lobe passes, the plunger descends under gravity and/or spring force. Shallots fed manually or via hopper rest on a fixed stainless-steel blade grid (3 × 4 in., typically 4 × 4 mm or similar spacing). During each downward stroke, the plunger presses the bulbs through the grid, shearing them into uniform pieces in a single pass. Key design parameters include cam profile (determines stroke length and impact velocity), plunger mass/spring stiffness (controls cutting force and cycle frequency), and blade geometry (sharpness, spacing, food-grade alloy). The cycle rate—commonly 30–60 strokes min^{-1} for small-scale processors—yields consistent dice while minimizing cell damage and juice loss. Continuous operation is achieved by synchronizing feed rate with cam rotation, and safety interlocks prevent access to the blade zone during motion.



S.NO	PART NAME	S.NO	PART NAME	S.NO	PART NAME
01	DC MOTOR	04	TABLE	07	SUPPORT FRAME
02	CAM ARRANGEMENT	05	VEGETABLE	►	TO CONTROL UNIT
03	CUTTER	06	SLIDER GUIDE		

Figure 10: 2D Diagram of Cutting Mechanism

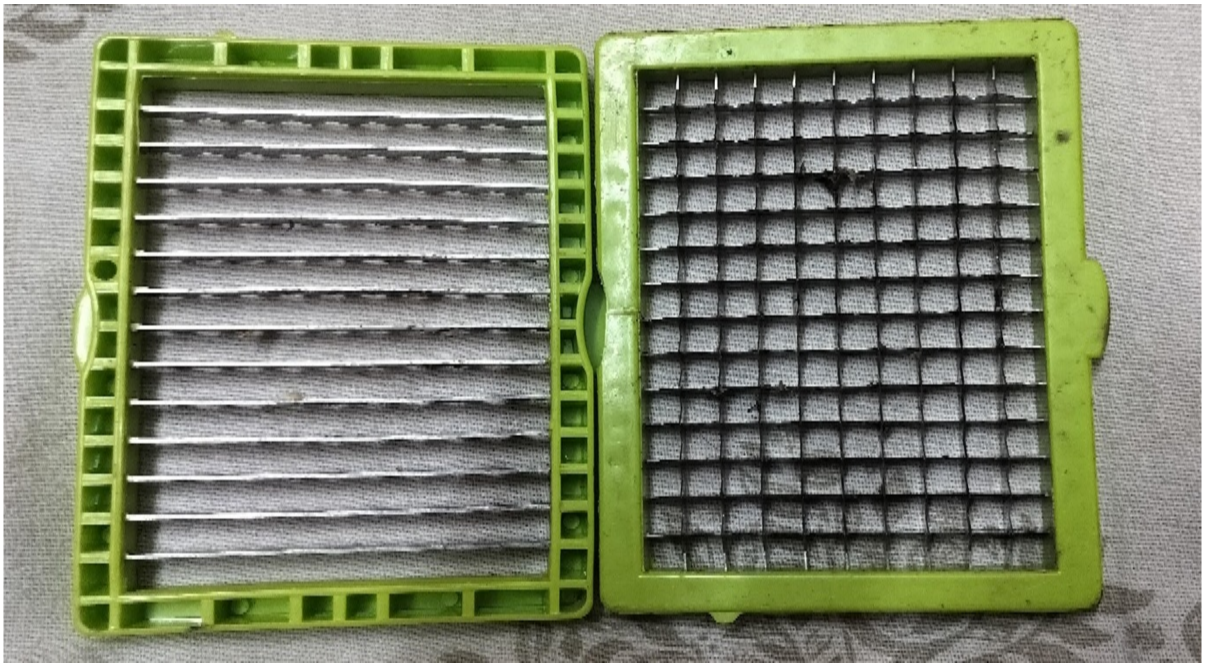


Figure 11: Different types of Blades used for cutting process

Section	Key Details for Manuscript
Principle of Operation	A single-slot eccentric cam, mounted on a geared electric motor shaft (0.25–0.37 kW), transforms rotary motion (300–600 rev min⁻¹) into linear reciprocation of a stainless-steel plunger. One cam revolution equals one cutting cycle.
Kinematics	Stroke length 60 – 80 mm; dwell of 30°–45° ensures complete clearance for product feed. Effective plunger velocity at impact ≈ 0.5–0.8 m s⁻¹, calculated from v=2πrNv = 2\pi r Nv=2πrN whereas cam throw (25–40 mm) and NNN is rev s⁻¹.
Cutting Assembly	Blade cassette: 3 × 4 in. frame laser-cut from AISI 304, holding orthogonal knives (edge radius ≤ 5 µm) in a 4 × 4 mm lattice → ~225 cuts per stroke. Blades are interchangeable for different dice sizes.
Feed System	Hopper (4 L) guides whole peeled shallots onto the blade grid. Gravity feed is assisted by a vibratory tray phased to the cam to avoid bridging. Target surface loading: 4–6 kg m⁻² to maintain single-layer contact.
Force/Power Analysis	Average cutting force per stroke F=σs, AF=σsA (shear strength of shallot tissue) ≈ 0.35 MPa and AAA is total cross-section (≈ 1.2 × 10⁻⁴ m²) ⇒ FFF ≈ 40 N. Peak force, accounting for dynamic effects and safety factor (×2.5), ≈ 100 N, well within plunger/spring design. Motor torque requirement < 5 N m.
Throughput	At 45 strokes min⁻¹ with 35 g shallot per stroke, capacity ≈ 95 kg h⁻¹. Dice uniformity (coefficient of variation of cube edge) ≤ 4 %.
Quality & Safety	Rapid clean cut minimizes cell rupture → reduced alliinase activation, preserving pungency profile. All food-contact parts meet EN 1672-2 hygiene grade; interlocked polycarbonate guard rated to IP 65 disables motor when opened.
Maintenance	Blades resharpened after 10⁶ cycles; cam and follower surfaces nitrated to 58 HRC, lubricated with NSF-H1 grease; full teardown/clean in < 15 n

Table 1: Parameters of cutting process and Mechanism

Table 2: Trial taken with the sample taken

Trials	Initial weight (g)	After Peeling (g)	After removal of peel (g)	Time taken (sec)
Trial 1	500 g	408 g	386 g	180 sec
Trial 2	500 g	392 g	382g	120 sec

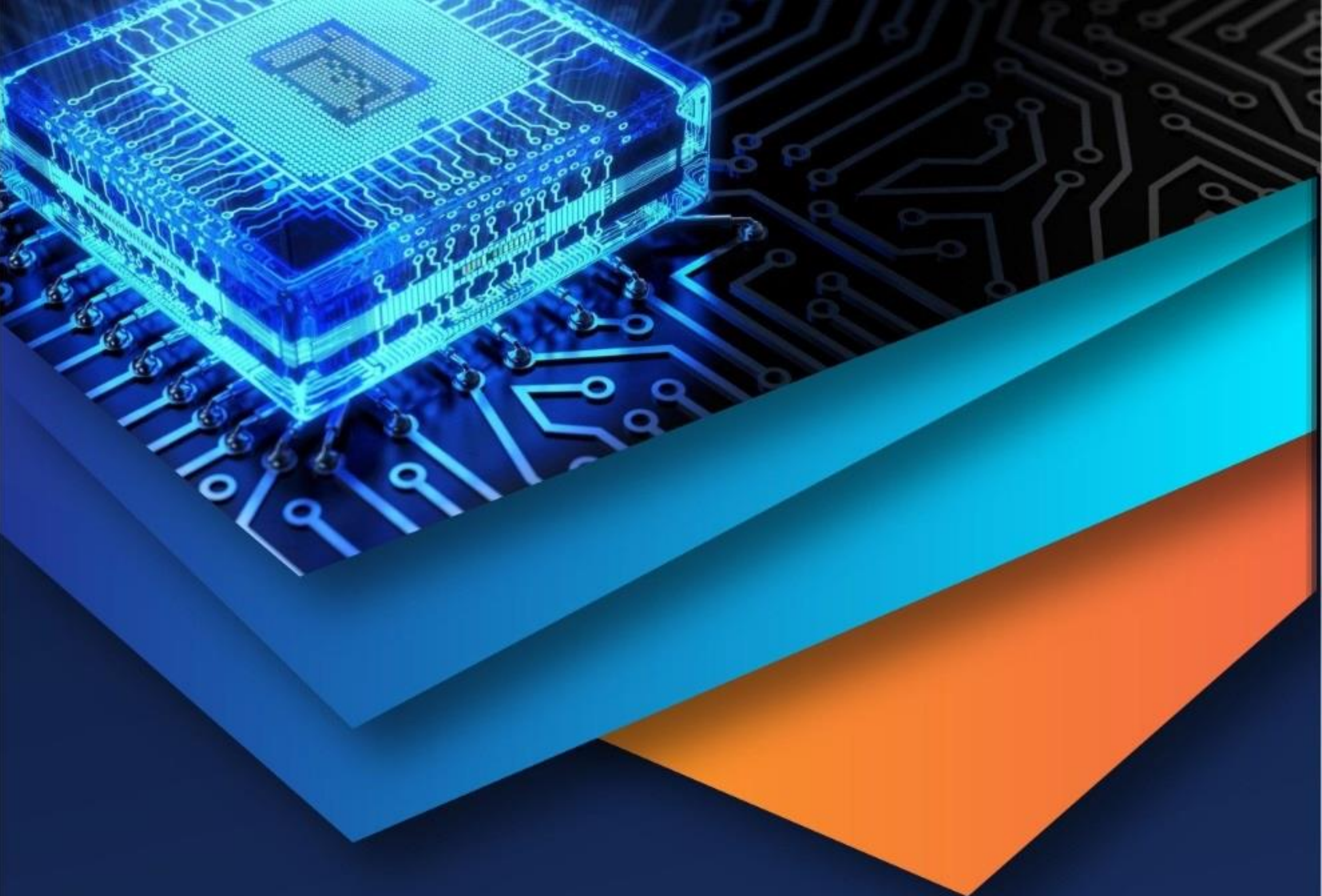
III. RESULT AND DISCUSSION

The developed Domestic Shallot Peeler cum Cutting Machine was evaluated for its performance based on peeling efficiency, cutting efficiency, processing time, damage rate, and power consumption. The machine achieved a peeling efficiency of 85–90% and a cutting efficiency of 92–95%, processing 500 grams of shallots in approximately 2–3 minutes, with a total machine capacity of 8–10 kg per hour. The damage rate was kept below 5%, indicating effective handling of the shallots without excessive bruising or breakage. Power consumption ranged between 0.5–0.7 kWh, making the machine energy-efficient and suitable for small-scale operations. The results demonstrated that the machine provides clean and uniform peeling and cutting with minimal manual intervention, significantly reducing labour and processing time. Minor residual skin was observed on a small portion of shallots, largely attributed to size variations, but it did not significantly impact the quality of the processed product. The machine's compact design, ease of cleaning, and user-friendly operation further support its application in restaurant kitchens, catering units, and small food processing industries. Overall, the machine meets its intended objectives, and with minor design enhancements, such as adjustable peeling intensity and variable cutting options, its performance could be further optimized. As a result, After 180 seconds(3 minutes) the shallot was completely peeled and the waste peel removed by cleaning the peeled shallots with water to remove the waste peel and dirt. Then, the shallots are peeled and the hard root end are not removed by the peeling process. The 500 g of sample had been taken and it results 386 g of peeled shallots after cleaning. Peeled shallots(%) is around 72.2% and the loss(%) is 27.8%.

REFERENCES

[1] R. Hegazy, "Development of onion peeling machine suitable for small-scale agricultural industries," Fresenius Environmental Bulletin, vol. 29, no. 10, pp. 9393–9402, 2020.
[2] M. El-Ghobashy and A. Bahnasawy, "Development and evaluation of an onion peeling machine," Agricultural Engineering International: CIGR Journal, vol. 13, no. 2, pp. 1–10, 2011.
[3] Y. R. Joslin, G. Alagukannan, A. Rajkala, and S. Shobana, "Evaluation of multiplier onion varieties suitable for Ariyalur district," Journal of Krishi Vigyan, vol. 8, no. 2, pp. 322–325, 2020.
[4] H. Hariz, "Design and development of the onion peeling machine using compressed air," Politeknik Malaysia Journal of Engineering and Technology, vol. 6, no. 2, pp. 45–50, 2018.
[5] A. E. Bahnasawy and M. H. El-Ghobashy, "Design and performance evaluation of an onion peeling machine," Misr J. Agric. Eng., vol. 29, no. 2, pp. 648–667, 2012.
[6] M. Ali and A. Hussain, "Development of a manually operated onion peeling machine," International Journal of Scientific and Research Publications, vol. 6, no. 3, pp. 221–224, 2016.
[7] A. B. Tiwari and A. P. Khambalkar, "Design of batch type multiplier onion peeler," CIGR Journal, vol. 12, no. 3, pp. 64–69, 2010.
[8] S. R. Patil et al., "Development and performance evaluation of an onion peeling machine," International Journal of Agricultural Engineering, vol. 6, no. 2, pp. 509–514, 2013.
[9] A. N. Jamadar et al., "Design and fabrication of onion peeling machine," International Journal of Advanced Engineering Research and Studies, vol. 2, no. 4, pp. 50–52, 2013.
[10] A. Kumar and A. Kumar, "Development of onion cutting and peeling machine," International Journal of Engineering and Technical Research, vol. 4, no. 5, pp. 83–85, 2016.
[11] A. Sharma et al., "Design and analysis of an onion slicing machine," International Journal of Research in Engineering and Technology, vol. 5, no. 4, pp. 110–113, 2016.
[12] A. M. Yadav and V. D. Jadhav, "Design and fabrication of automatic onion cutting machine," International Journal of Mechanical Engineering and Robotics Research, vol. 3, no. 1, pp. 17–21, 2014.
[13] A. T. Deshmukh and M. S. Jadhav, "Design and development of onion slicing machine," Journal of Multidisciplinary Engineering Science Studies, vol. 2, no. 8, pp. 715–718, 2016.
[14] S. S. Deore and S. S. Ingle, "Development of onion peeling and slicing machine," International Journal for Scientific Research & Development, vol. 5, no. 4, pp. 89–91, 2017.
[15] B. P. Kantu, "Design of a single point cutting tool," International Research Journal of Engineering and Technology (IRJET), vol. 9, no. 4, pp. 1070–1075, 2022.
[16] S. S. Gawande, "Cutting response of single point cutting tool using FEA," IRJET, vol. 7, no. 11, pp. 1197–1202, 2020.
[17] K. H. Wankhade et al., "Analysis of single point cutting tool," IRJET, vol. 6, no. 5, pp. 835–840, 2019.

[18] M. R. Rathod, "Review on single point cutting tool," IRJET, vol. 4, no. 11, pp. 207–210, 2017.
[19] S. Kale and R. Kanherkar, "Design and static analysis of cutting tool using finite element approach," IRJET, vol. 5, no. 11, pp. 1108–1112, 2018.
[20] [N. S. More and A. S. Kedar, "Taguchi approach for optimizing tool geometry," IRJET, vol. 6, no. 9, pp. 346–350, 2019.
[21] K. P. Shewale et al., "Design and analysis of food processing machine components," International Journal of Engineering Trends and Technology, vol. 42, no. 4, pp. 178–182, 2017.
[22] V. D. Suryawanshi, "Design optimization of cutting blades for vegetable slicer," IJRTE, vol. 8, no. 4, pp. 2457–2460, 2019.
[23] A. K. Nayak and A. S. Mahapatra, "Design and development of a centrifugal slicer," Journal of Food Process Engineering, vol. 35, no. 5, pp. 702–709, 2012.
[24] M. B. Bhise and A. D. Nawghare, "Development of manually operated slicer for onion," Engineering and Technology in India, vol. 6, no. 2, pp. 126–130, 2015.
[25] R. D. Patil et al., "Development of cutting mechanism for vegetables," International Journal of Emerging Technologies in Engineering Research, vol. 5, no. 8, pp. 13–16, 2017.
[26] M. A. Sangle and M. R. Deshmukh, "Design of vegetable cutting mechanism," International Journal of Science and Research (IJSR), vol. 6, no. 5, pp. 321–324, 2017.
[27] M. P. Wani and A. S. Bansod, "Mechanical design of food slicer machine," IJRASET, vol. 7, no. 3, pp. 1005–1009, 2019.
[28] R. K. Waghmare et al., "Design of onion peeling and cutting machine," International Journal of Advance Engineering and Research Development, vol. 5, no. 3, pp. 147–150, 2018.
[29] S. P. Sonawane and A. B. Thorat, "Design and development of automated vegetable cutting machine," International Journal of Engineering and Management Research, vol. 9, no. 2, pp. 62–65, 2019.
[30] P. B. Chougule and V. N. Bachche, "Design and fabrication of onion cutter," International Journal of Innovative Research in Science, Engineering and Technology, vol. 4, no. 6, pp. 4403–4407, 2015.



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