ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25aug261

Design and Development of a Compact and Motorised Vegetable Slicer Machine

A Low-Cost, User-friendly Solution for Efficient Domestic and Semi-Commercial Vegetable Processing

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Publication Date: 2025/08/14

Abstract: This paper presents the design and development of a compact motorized vegetable slicer machine tailored for household and small-scale commercial use. The device addresses common challenges in conventional vegetable cutting methods, such as inconsistent slicing, time consumption, and hygiene issues. The system incorporates a 12V DC gear motor, a blade arrangement, and a safe feeding mechanism that efficiently slices a variety of vegetables, including carrots, radishes, onions, potatoes, and bananas. Built using readily available, cost-effective materials like mild steel, plywood, and rubber supports, the machine ensures durability, simplicity, and affordability. The slicer minimizes manual effort, reduces waste, and delivers uniform slice thickness with improved safety and efficiency. This work emphasizes practical kitchen innovation through low-power consumption and compact structural design, making it a valuable contribution to food processing automation. Future improvements are also discussed to enhance the slicer's performance and versatility.

Keywords: *Vegetable Slicer Machine; DC Gear Motor; Compact Design; Food Processing; Low-Cost Automation; Domestic Application.*

How to Cite: Dnyaneshwari V. Gophane; Suraj S. Gele; Ashish S. Shinde (2025), Design and Development of a Compact and Motorised Vegetable Slicer Machine. *International Journal of Innovative Science and Research Technology*, 10(8), 282-285. https://doi.org/10.38124/ijisrt/25aug261

I. INTRODUCTION

In today's fast-paced world, the demand for efficiency and hygiene in food preparation has never been higher. Vegetables, being a staple in daily diets across households, hostels, restaurants, and industrial kitchens, require regular slicing before consumption or cooking. Traditional vegetable cutting methods—whether manual or semi-automatic—are often time-consuming, inconsistent in output, physically demanding, and prone to hygiene issues due to human contact and surface contamination.

Commercial electric vegetable slicers do exist, but they are typically bulky, expensive, and often designed for large-scale use, making them impractical for common users or small establishments. Moreover, manual cutting tools pose safety hazards and produce non-uniform slices, which affect the aesthetics and cooking quality of food.

To address these challenges, this research paper presents the design and development of a compact motorized vegetable slicer machine that provides a low-cost, efficient, and user-friendly solution. The proposed system utilizes a 12V DC gear motor to power sharp blades fixed on a rotating shaft. Its body is constructed using lightweight, durable, and low-cost materials like plywood and mild steel. The design emphasizes portability, safety, ease of operation, and energy efficiency.

The machine is capable of slicing vegetables such as carrots, potatoes, onions, bananas, and radishes with consistent thickness and minimal human effort. It has been specifically designed to suit the needs of households, hostel kitchens, and small food vendors. In addition, it ensures cleanliness and reduces waste by maintaining uniform slice size.

This paper further details the research motivation, component selection, system design, working mechanism, results, cost estimation, and future scope. The project contributes to the field of small-scale food automation by offering a practical and economical solution tailored for daily use.

II. RESEARCH GAP

In the context of modern kitchens—whether domestic or small-scale commercial—the need for fast, hygienic, and efficient vegetable slicing is growing. Manual cutting is still widely practiced, but it presents several challenges including

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25aug261

uneven slices, risk of contamination, and the requirement of continuous human effort. On the other hand, existing electric slicers in the market are generally designed for industrial use, making them bulky, expensive, and unsuitable for common users.

The review of current solutions revealed a major gap: a compact, cost-effective, and easy-to-use vegetable slicing machine that can be operated safely in everyday environments like homes, hostels, and small messes. While earlier patents and mechanical designs have proposed motorized slicing systems, most require either high investment, skilled operation, or excessive space.

The motivation behind this project stemmed from the need to bridge this gap by designing a simple, affordable, and reliable slicer machine using basic mechanical and electrical components. The design was inspired by prior inventions (as referenced in the report) but re-engineered using locally available materials and a straightforward mechanism.

As detailed in the report, the developed machine consists of a 12V DC gear motor**,** sharp, mild steel blades, a fixed feeding chute, and a wooden base frame, all arranged for optimal performance and ease of use. The machine ensures consistent slice thickness, minimal electricity usage, and reduced physical effort, making it highly relevant for local users.

This innovation offers a practical alternative to expensive commercial machines and inefficient manual cutters, promoting safe and hygienic food preparation while maintaining simplicity and low cost.

III. PROBLEM STATEMENT

Vegetable slicing is a fundamental step in food preparation, yet it remains a time-consuming and labour-intensive task when performed manually. Traditional methods often result in uneven slices, increased preparation time, and a higher risk of contamination due to direct hand contact. While commercial vegetable slicers exist, they are typically designed for large-scale use, making them expensive, bulky, and unsuitable for domestic or small kitchen environments.

The absence of an affordable, compact, and user-friendly solution for efficient vegetable slicing creates a significant challenge for households, hostels, and small food vendors. There is a need for a machine that can reduce manual effort, ensure uniform slicing, maintain hygiene, and operate on minimal power without occupying large space.

This project addresses this problem by developing a compact motorized vegetable slicer machine that is easy to assemble, economical to build, and safe to operate. The design focuses on simplicity, effectiveness, and suitability for everyday kitchen use.

IV. OBJECTIVES

The aim of this project is to design and fabricate a compact, low-cost vegetable slicer machine for efficient and hygienic slicing in small-scale kitchens. The key objectives are:

- To develop a simple and electrically operated vegetable slicer using easily available materials.
- To ensure uniform and consistent slicing of various vegetables with minimal manual effort.
- To create a compact and lightweight design suitable for domestic and hostel kitchen use.
- To improve hygiene and reduce the risk of contamination during vegetable preparation.
- To minimize energy consumption while maintaining safe and user-friendly operation.

V. DESIGN AND DEVELOPMENT

Fig 1 Stand of Vegetable Slicer

Fig 2 Side-View of Vegetable Slicer

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25aug261


Fig 3 Front-View of Vegetable Slicer


Fig 4 Blade Arrangement of Vegetable Slicer

VI. WORKING PRINCIPLE

The vegetable slicer machine operates on a simple electromechanical principle where rotary motion generated by a DC gear motor is used to drive slicing blades for cutting vegetables. The system is powered through an AC to DC converter, supplying 12V to the gear motor. When the switch is turned on, electrical energy is converted into mechanical rotational motion by the motor.

This rotational motion is transmitted directly to a shaft on which the slicing blades are mounted. As the blades rotate at a steady speed, vegetables inserted through the feeding chute come into contact with the sharp edges of the blades. The motion enables the blades to continuously slice the vegetables into uniform pieces.

The feeding chute is designed to allow vegetables to be inserted without pre-cutting, reducing preparation time. A collection tray or base area is positioned below the cutting unit to gather the sliced pieces safely and neatly.

The design ensures user safety by keeping moving parts enclosed and using materials that offer stability and minimal vibration. The rubber stands at the base helps absorb shocks and prevents slipping during operation. Overall, the machine converts electrical input into a controlled slicing action, achieving efficient and uniform cutting with minimal human intervention.

VII. RESULTS AND OBSERVATIONS

After the successful assembly and testing of the vegetable slicer machine, several observations were made regarding its performance, usability, and reliability.

The machine effectively sliced a variety of vegetables including carrots, radishes, potatoes, onions, and bananas. The slices produced were uniform in thickness, demonstrating the effectiveness of the blade arrangement and consistent rotational speed provided by the DC gear motor. The motor operated smoothly at 12V, with minimal noise and vibration, supported by the rubber stand at the base, which ensured stability during operation.

Time taken for slicing was significantly reduced compared to manual cutting methods. For example, slicing one medium-sized potato manually took approximately 1.5 minutes, whereas the machine completed the same task in under 20 seconds. This time efficiency was consistent across other vegetables as well.

The machine also performed reliably in repeated operations, showing no overheating or component failure during continuous use. User handling was simple, requiring only basic switching on and feeding of vegetables, making the device suitable even for users without technical experience.

The physical structure, including the plywood base, steel frame, and enclosed motor-blade setup, proved to be sturdy, safe, and easy to clean. No significant wear or blade damage was observed after multiple test runs, indicating the durability of the components used.


Fig 5 Chopped Vegetables

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25aug261

VIII. APPLICATIONS

The developed vegetable slicer machine is versatile and suitable for a wide range of practical applications in both domestic and semi-commercial settings. Due to its compact design, low energy consumption, and ease of operation, it can be effectively used in the following areas:

- Household kitchens for everyday slicing of vegetables such as potatoes, carrots, radishes, onions, and bananas.
- Hostel and mess kitchens, where large quantities of vegetables need to be sliced quickly and consistently.
- Street food vendors and small restaurants, for improving preparation speed and maintaining hygiene.
- Catering services, where timesaving and uniformity in food preparation is essential.
- Educational and demonstration purposes in polytechnic or vocational institutes focusing on food processing or mechanical design projects.

This wide applicability reflects the practical relevance of the machine and its potential for reducing manual effort while improving efficiency in food preparation tasks.

IX. FUTURE SCOPE

The vegetable slicer machine developed through this project serves as a foundational model for small-scale automation in food processing. While it performs efficiently in its current form, several improvements and enhancements can be explored in the future to expand its capabilities and usability.

- Addition of variable speed control to adjust slicing speed based on vegetable type.
- Use of interchangeable blades for different slicing styles like dicing or julienne cuts.
- Integration of an automatic feeding system to reduce manual handling.
- Adoption of food-grade and waterproof materials to enhance hygiene and durability.
- Development of a battery-operated or solar-powered version for use in areas with limited electricity.

X. CONCLUSION

This project successfully demonstrates the design and development of a compact motorized vegetable slicer machine that addresses common limitations of manual and bulky electric slicers. The machine provides uniform slicing, reduces preparation time, and enhances safety and hygiene in food handling. Built using cost-effective and easily available materials, it is well-suited for domestic kitchens, hostels, and small vendors. The results confirm its efficiency and ease of use, while future improvements like speed control and automatic feeding can further increase its utility and commercial scope.

ACKNOLEDGEMENT

We would like to express our sincere gratitude to the faculty members of the Mechanical Engineering Department at SVERI's College of Engineering, Pandharpur, for their valuable guidance, technical support, and continuous encouragement throughout the development of this project. We are especially thankful to our project guide for their insightful suggestions and motivation. We also extend our thanks to the laboratory staff for providing the necessary resources and support during fabrication and testing. Lastly, we are grateful to our teammates, families, and friends for their cooperation, dedication, and moral support, which contributed significantly to the successful completion of this work.

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