

Methodology for Design and Fabrication of Garlic Peeling Machine-A Review

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Abstract— This paper presents the methodology for design and fabrication of garlic peeling machine with the related search. The study specifies factors influencing the garlic peeling process and recommends a number of design options for garlic peeling machine. These are based on a systematic study of the garlic peeling process and testing of a prototype model of garlic peeling machine. For which we consider literatures reviews & some of them are explained.

Key words: Garlic, peeling process, modelling, oscillation motion

I. INTRODUCTION

India is one of the leading Garlic producing countries. The area under cultivation and production of garlic in India (2010-11) is 200.70 thousand ha and 1061.85 thousand tons. Madhya Pradesh, Gujarat, Orissa, Rajasthan, Karnataka, Tamil Nadu, Maharashtra, Bihar and UP are the major Garlic producing states. Study revealed that the area and production of garlic is increasing in most of the states.

Garlic is the most important foreign exchange earning spicy vegetable crop, commercially grown in India. Indian garlic is now exported even to Pakistan, Thailand, and USA, Nepal and Malaysia as well as the traditional market of Bangladesh. About 21,827.16 metric tons of Garlic bulbs amounting to Rs.7, 731.52 lakhs were exported during 2010-11. During the year 2006-07, the export of dehydrated powder and flakes was to the tune of 780 tonnes worth Rs. 437 lakhs and 188 tons worth Rs. 108 lakhs respectively.

Garlic has digestive, carminative and anti-rheumatic properties. It is used in aurvedic formulation since ancient times for curing muscular pain, giddiness, lungs, heating intestinal ulcer, etc. Garlic is consumed as green as well as dried in the spice form and as ingredient to flavour the various vegetarian, non-vegetarian dishes and pickles. Good tasty pickles, chutneys, curry powders are prepared from Garlic cloves. Garlic is also used to disguise the smell and flavour of salted meat and fish. Dehydrated Garlic in powdered or granulated form is being used in place of fresh bulbs in many countries.

Since the cost of fresh Garlic is widely fluctuating (Rs 5 to Rs 100 in a year), simple process technology need to be made available for preparing quality products with long shelf life from Garlic during the season for their use in off-season. Further because lack of available time for kitchen work, the demand for ready to use product is increasing with increase in number working women in urban areas.

As true for any other perishable crop, the Garlic producers and several NGOs have repeatedly expressed the need for a small scale low cost technology for processing of Garlic for value addition.

Manually garlic peeling process is time consuming. In one method, the cloves are dressed with edible oil (2-3%)

& salt (1-2%) and then conditioned in open sun to loosen the skin. It requires 4-5 hours.

Very little work has been done on the garlic peeling and it is restricted to traditional peeling methods only. Traditional peeling methods viz.; hand peeling, flame peeling, oven peeling and chemical peeling are being used in processing industries, big restaurants, hotels and kitchens. These are laborious, time consuming, cost intensive and restrict speed of processing activity. Because of its typical shape, the mechanical peeling of garlic is still untouched by process engineers. Further, this unit operation requires special care and skill to reduce material damage.

Keeping this in view, a study was undertaken with the main objective of development of a garlic peeler. The proposed development of a garlic peeler could alleviate the problems faced by traditional garlic peeling methods and aid in boosting the processing and export of garlic and its products.

The machine will be reducing this time of peeling of garlic. In another method, the oil dressed cloves are heat up and stirred in wide pan for a short duration and then peeled manually through rubbing against gunny bag or palm. Though, these local methods alleviate the drudgery of hand peeling, however the hygienic conditions are not maintained, which are must for retaining the quality of products for export as well as for local market. An efficient peeling device is therefore required to gently peel off the skin from Garlic clove without any adverse effect on its shape, structure and aroma.

II. EARLIER WORK ON GARLIC PEELING MACHINE

The percentage composition of typical garlic is: the portion of the plant most often consumed is an underground storage structure called a head. A head of garlic is composed of a dozen or more discrete cloves, each of which is a botanical bulb, an underground structure comprised of thickened leaf bases. Each garlic clove is made up of just one leaf base, unlike onions, which are composed of numerous leaf layers.



An automatic garlic-peeling machine has been developed in the country and the peeled garlic is 100 per cent free from damage. One of such machine has already been exported to Pakistan. The specialized machine meant primarily for use in the pickle industries developed by M Nagarajan of M/s Virgo Engineering Works Usilampatti, Madurai and Tamil Nadu has been recently awarded Rs. 1 lakh Meritorious Invention Award of the National Research Development Corporation. The indigenous machine's cost at Rs. 1 lakh is supposed to be much less than the imported varieties, which cost over Rs. 4 lakh. With capacity of handling over 80 kgs per hour of garlic pods, it would replace the conventional unhygienic, space and labor intensive manual method used presently for peeling garlic by the pickle industry.

The machine's technology is fairly simple in which full garlic is put into the hopper and enters a stainless steel drum inside which a vertical shaft with rubber pads is rotating. The garlic gets in contact with the rubber pads and with other garlic and the skin gets skimmed off and falls. A blower section has been placed near the outlet, which blows away the skin to a dust collection box via an aluminium pipe. The peeled garlic is collected at the outlet through the collection box without the skin.

The full garlic-peeling machine works on the principle of conversion of electrical energy from electrical motor into mechanical energy in terms of rotating shaft.

A 2 HP motor is used to rotate the shaft at 900 rpm around which around 70 rubber pads are fixed. When the full garlic enters the peeling chamber it gets split into individual pieces (without damage) and when they move through the rotating shaft the skin gets peeled off.

The developed garlic peeler consisted of a feed hopper, roller and concave mechanism, blower and power transmission system. The performance of the garlic peeler was evaluated at different level of combinations of the study variables namely, cylinder speed, concave clearance, concave mechanism and moisture content. Based on the results, optimal values of study variables were recommended for the prototype garlic peeler on the basis of peeling efficiency, yield of peeled and unpeeled garlic, damage, energy requirement, peel separation performance and capacity. The performance of the prototype garlic peeler with the recommended specifications was evaluated.

Garlic is emerging as one of the important spice in the state as it has medicinal value and good export potential. Peeling of garlic is very deduce critical, time and labor consuming operation being accomplished manually in small scale garlic processing and pickle industries.

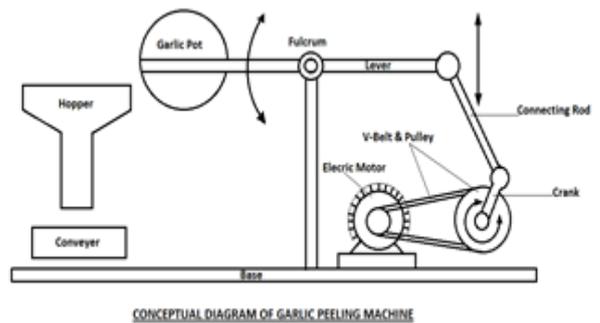
Therefore, to solve this problem, a garlic clove peeling machines (batch and continuous type) with 10-kg/hr capacity have been developed. The batch type garlic clove peeling has been evaluated and found satisfactory with 92-94 per cent efficiency. A been designed. The machine is useful in flaking the cloves before drying, thereby enhancing the drying rate.



III. CONCEPT

Figure shows a conceptual diagram of garlic peeling machine. In this machine it will use the oscillating motion for peeling the garlic. Due to the impact force skin on the cloves of garlic will be removing.

In this machine garlic pot mounted on the lever which is hinged at the fulcrum. The other end of the lever is connected to the connecting rod. One end of the connecting rod is connected to the crank, which is mounted on the same



Shaft of pulley. The pulley is rotated by using the V-Belt and electric motor. Due to rotation of crank, the other end of connecting rod will be reciprocated. Due to reciprocation of this end garlic pot will be oscillate, and due to this oscillation garlic will be peeled.

IV. LITERATURE REVIEW

A. M. Nagarajan [1]:

M. Nagarajan is the innovator of Garlic peeling machine which is operated on the principle of rotary motion. He is awarded by National Innovation Foundation of India for his innovation in year 2005. The garlic peeling machine consists of a 2 HP electric motor, blowers, a peeling chamber, inlet, outlet, exhaust pipe and drives. The peeling chamber has a

provision for garlic inlet and a shaft on which the blades are arranged in such a manner that there are six rows and each row consists of four blades placed at an equiangular distance of 90 degrees. These blades are made of the same material that is used for power transmission. The arrangement of blades is in two consecutive rows. In one row, the blades intersect vertically and horizontally, and in the other row, the blades intersect diagonally. The alternate row has the same arrangement. The peeling chamber is cylindrical and the internal walls are serrated. The drive consists of three shafts, pulleys with two grooves and single groove. The drives are transmitted with the use of V-belts. The machine consists of two blowers of different sizes. The purpose of the big blower is to push out the dust and the skin of garlic, removed by the rotation of blades. The purpose of the small blower is to remove moisture from the garlic while feeding it into the machine. Housing, made of a steel sheet, covers the entire mechanism.

B. J. De La Cruz Medina And H.S. Garcia [2]:

J. De La Cruz Medina and H.S. Garcia are the member of organization name is, Instituto Tecnológico de Veracruz. According to authors Garlic is one of the most popular spices in the world. It is reported that in ancient Egypt, the workers who had to build the great pyramids were fed garlic daily, and the Bible mentions that the Hebrews enjoyed their food with garlic. In the First World War, garlic was widely used as an antiseptic to prevent gangrene and today people use garlic to help prevent atherosclerosis and improve high blood pressure.

C. El-Ghobashy, H. Adel H. Bahnasawy, Samir A. Ali, M. T. Afify, Z. Emara [3]:

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These are the developers of onion peeling machine. Onions has been a popular food for many centuries. Today they are valued for their flavor, aroma, and taste, being prepared domestically or forming raw materials for a variety of food processes (dehydration, freezing, canning and pickling). They are probably the most universally used vegetable in most countries. Onion peeling is an essential step in producing many of the onion products such as dehydrated onions, onion powder, onion flavoring, onion salt, onion rings, and pickled and canned onions. Several methods have been used for peeling onions. The common methods used in modern onion processing industry are lye treatment, flame peeling, and mechanical peeling. An onion peeling machine was designed, manufactured, developed and evaluated to suit the small and medium processing units. The onion peeling machine consists of seven parts, main frame, peeling drum, inlet and outlet openings, collection basin, water and air supplying systems, and power transmission.

D. Prof. Rajendra Prasad [4]:

Prof. Rajendra Prasad is a professor in IIT Delhi and he is published a paper under a heading of A Technology Package of Garlic Processing for Value Addition and he said, garlic is the most important foreign exchange earning spicy vegetable crop, commercially grown in India. Indian garlic is now exported even to Pakistan, Thailand, USA, Nepal and Malaysia as well as the traditional market of Bangladesh. Garlic has digestive, carminative and anti-rheumatic properties. It is used in aurvedic formulation since ancient times for curing muscular pain, giddiness, lungs, heating intestinal ulcer, etc. Garlic is consumed as green as well as dried in the spice form and as ingredient to flavour the various vegetarian, non-vegetarian dishes and pickles.

E. Londhe V.P.*, Gavasane A.T., Nipate S.S., Bandawane D.D., Chaudhari P.D. [5]:

According to authors Garlic, *Allium sativum L.* is a member of the Alliaceae family, has been widely recognized as a valuable spice and a popular remedy for various ailments and physiological disorders. The name garlic may have originated from the Celtic word 'all' meaning pungent. Cultivated practically throughout the world, garlic appears to have originated in central Asia and then spread to China, the Near East, and the Mediterranean region before moving west to Central and Southern Europe, Northern Africa (Egypt) and Mexico. Garlic has been used for thousands of years for medicinal purposes. Sanskrit records show its medicinal use about 5,000 years ago, and it has been used for at least 3,000 years in Chinese medicine. The Egyptians, Babylonians, Greeks, and Romans used garlic for healing purposes. In 1858, Pasteur noted garlic's antibacterial activity, and it was used as an antiseptic to prevent gangrene during World War I and World War II. Garlic's current principal medicinal uses are to prevent and treat cardiovascular disease by lowering blood pressure and cholesterol, as an antimicrobial, and as a preventive agent for cancer. The active constituents are several complex sulfur-containing compounds that are rapidly absorbed, transformed and metabolized. Pooled data from numerous randomized trials suggest that garlic lowers total cholesterol concentrations by approximately 10% and favorably alters HDL/LDL ratios. Randomized trials also support garlic's effectiveness as a mild antihypertensive which lowers blood pressure by 5-7%. Garlic also inhibits platelet aggregation and enhances fibrinolytic activity, reducing clots on damaged endothelium. *In vitro* data suggest antibacterial effects, but these have not been evaluated in controlled trials in humans.

V. RESEARCH METHODOLOGY

The research methodology will cover as follow –

- Identification of design parameters.
- Design of Garlic Peeling Machine.
- Modelling of Garlic Peeling Machine.
- Fabrication of Garlic Peeling Machine.
- Testing of machine.

The approach will be Design, Modelling, Fabrication and Testing of the machine.

VI. CONCLUSION

The main conclusion will be drawn find out whether it is possible to automate a skilled manual process which would avoid worker fatigue. Also the future scope for developing the generalized machine for any shape and condition of garlic.

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