A Machine to Remove the Seed from Ceylon Olive (Veralu)

J.C. Wickramaarachchi*, R.J. Wimalasiri

The Open University of Sri Lanka, Nawala, Nugegoda, Sri Lanka

* janeshchathuranga6@gmail.com

Abstract - Veralu (Ceylon olive) is a fruit commonly found in many areas of Sri Lanka, especially in wet and intermediate zones. Olives and Veralu are fruits of the same category, large quantities of olives are imported to Sri Lanka annually and large portion of Veralu is wasted without consumption. Countries which produce and exports olive, such as Spain, Greece, Portugal, Morocco, earn a lot of income. If veralu can be given such added value, it could create a source of foreign exchange to our country. It has been experimentally proven that in terms of the nutrition and healthy aspects Ceylon olives possess a higher nutritional value compared to olives. Bottled pitted olives (seed removed olives) are readily available in local supermarkets and groceries. If value added pitted Ceylon olives could be introduced to the market, it can easily complete with imported olive products. Removing seeds from Veralu has not been tried out or done previously. Removing the seed without damaging the flesh is a challenging task. To promote the Veralu based industry in Sri Lanka, a suitable automated seed removal mechanism should be developed which was the main aim of this study. A machine was designed and developed. The developed prototype was tested and expected outcome could be achieved. The productivity of the developed machine was 7.2 kg per hour or about 1200 fruits per hour. The total cost of the prototype is LKR 50000.00.

Keywords: Ceylon Olive (Veralu), seed removing, pitted Ceylon Olives

I. INTRODUCTION

This Elaeocarpus serratus also called Ceylon olive or wild olive, is a species indigenous to Sri Lanka. Locally known as Veralu. The Ceylon olive trees are naturally grown in home gardens across the country. Ceylon olives can be seen about twice a year, in March, April, and October.

In Sri Lanka, Ceylon olives are popular as only street food during veralu season. In addition, high-value-added products can be prepared from veralu. Those can be in the form of pitted veralu cans or jars, stuffed veralu, etc. These kinds of value-added products are not currently produced in Sri Lanka. But a large quantity of foreign olives-based products is imported to Sri Lanka. According to the data from Keells supermarket chain, about 20000 bottles of processed olives are sold each year. Pitted and stuffed veralu bottles are good substitute for this, and it is also a very nutritious product. To prepare this product, removing seeds from Ceylon olive is essential. Under this study a machine to remove the seed from Sri Lankan olive was designed and developed and tested for its functionality.

II. MATERIALS AND METHODS

The Product Design and Development approach was adhered to throughout the study. Data was gathered from the literature, conduct experiments, trial and error techniques, studying existing fruit pitting machines and their mechanisms, and by discussing with experts. Analysis part was conducted using gathered data and suitable mechanism was selected. The aspects such as size of the fruit (average diameter between 18 to 21 mm, average length between 25 to 28mm and average diameter of the seed between 8 to 10 mm) condition of the fruit (matured or ripe) and required force to remove the seed from veralu fruits and costs were considered in developing conceptual designs. Then the most appropriate design was selected and developed.

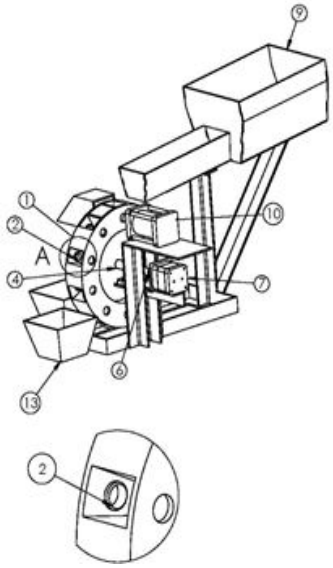
This machine was manufactured and fabricated using locally available materials. The drawing and components of the machine are shown in Figure 1. The machine consists of a hopper, guide path, a pneumatically operated plunger driving mechanism (punching unit), rotary Ceylon olive carrier, and collecting trays. The punching and cutting unit was mounted on the main frame of the machine. It contains a pneumatic actuator, which helps to create pressure and can easily push plunger back and forth. The punching plunger was directly attached with the pneumatic actuator which penetrates the fruit when actuated. After this operation, the plums seeds are dropped directly into the seed collector. Also, the fleshes of Ceylon olives were gone to the flesh collector, which is placed under the rotor. The back-and-forth movements of the plunger depend on the sensor signal and this process occur continuously. The other important part is the rotor and same size pockets are located around the rotor. The size of the pocket is about the size of the Ceylon olive fruit. Function of the rotor is to transport Ceylon olives to the deseeding point. Rotor is driven by stepper motor according to the program. Guide path was used to guide, and gates were used to control the flow. The operational control unit of this machine was fitted with the main frame of the machine. It helps control the sensor and all types of operation using certain programs and electric circuits. Arduino was used to program the machine. Seed removing process steps are,

- Ceylon olive guiding
- Ceylon olive transport to the deseeding point
- Punching
- Separation of fruit flesh and seed

III. RESULTS AND DISCUSSION

The veralu samples to evaluate the performance of the machine were collected from different trees. An electrical weighing balance and venire caliper were used for the weight, length, width, deseeding force measurements. Average force to remove the seeds were assessed as 300N and 65N for matured and ripe fruits respectively. According to the calculations and experimental data, FESTO pneumatic actuator with 32mm bore diameter, displacement of 100 mm and working pressure of 450N was used. Effectiveness of the machine was calculated for both ripe fruits (15 weeks after flowering) and matured fruits (12 weeks after flowering). Effectiveness of the machine for ripe fruits and matured fruits for 63.25% and 86.35% respectively. According to that matured fruits are more suitable. It takes a lot of force to remove the seed from the well matured Ceylon olives and the fruit wastage is low. Ripe fruits required less power and fruit wastage is high.

Actual image of the machine is shown in figure 1



ITEM NO.	PART NUMBER
1	Rotor
2	Cutter
3	Pillow Block Bearing
4	Main Shaft
5	Base
6	stepper bracket nema 17
7	NEMA17
8	flex coupler
9	Hopper
10	Pnumatic Cylinder
11	Pnumatic Shaft
12	Discharger
13	Basin

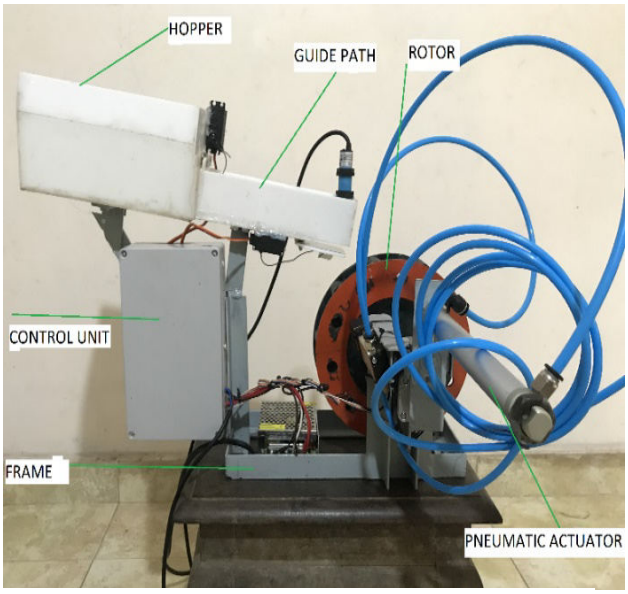


Figure 1: Drawing and actual image of the machine

IV. CONCLUSION

The Ceylon olive seed removing machine was designed, constructed and evaluated for removing the seeds from the Ceylon olive fruits. The effectiveness of the machine and fruit pulp

wastage varied with the condition of fruit that means ripe fruits and unripe fruits. This machine is designed to reduce human efforts and increasing the production. It also limits the human contact with the fruit thus maintaining the hygiene. This machine can be easily operated for similar types of fruits and be actually changed its different type of parts and components very simply. As examples for similar fruits, Olive, cherry, dates, aonla, plums etc. The capacity of the developing machine was around 1200 fruits per hour. In this machine, single actuator was used to remove seeds from Ceylon olives but it can be improved to use number of actuators with advanced feeding mechanism. Capacity of the machine depend on the business scale. Also, it would encourage small to medium traders and entrepreneurs to improve the fruit processing industry in Sri Lanka. Future works may be carried out on effective continuous feeding mechanism to increase the capacity of the machine.

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