



DESIGN, DEVELOPMENT AND PERFORMANCE EVALUATION OF PORTABLE ONION DICING TOOL

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ABSTRACT

Onion (*Allium cepa L.*) is an edible bulb. Onion is also widely used in soups, pickles and cooked vegetable dishes, sauces Peeling, Cutting, Slicing and Chopping are considered as major unit operations involved in onion processing. At present cutting of onion in mass for various receipies is done by hand using knives in small restaurants and street vendors which is laborious, time consuming and causing much strain to hands and eye. In order to reduce the drudgery, a hand-operated onion dicing tool working on the principle of levers was designed and developed. The tool consisted of cutting blade, punching frame, outlet container for collecting diced onion. The onion dicing tool is capable of making 9 dices each having size 8x8 mm. The cutting efficiency of dicing tool was found to be 97.23%. The cost of the dicing tool was worked out to Rs. 5000/- with an average capacity of 60kg/h. More over this onion dicing tool will prevent the drudgery of cutting onion in large quantities.

Key words: Onion dicing, tool, cutting, efficiency, capacity, time saving.

Introduction

Onion (*Allium cepa L.*) is an edible bulb. While it is a vegetable at heart, it also acts as a spice in as much as it can provide an aromatic undertone to various dishes, without being a

major ingredient. The colour varies from white to red to purple, the shape from spherical to almost conical, and the diameter at the largest point from 10mm to 8cm or more. Onion is the fourth most important commercial vegetable crop in India covering an area of 10.52 lakh hectares which is 11.4 % of total vegetable area. The production of onion in the country is 168.13 lakh tonnes accounting for 10.4% of the total vegetable production (Anonymous,2010). India is the second largest onion growing country in the world. Indian onions are famous for their pungency and are available round the year. Onion is basically used for flavouring in cooking. It is used as a vegetable, or as a spice to bring out the flavour of other dishes without overpowering them. It often accompanies meat - especially mince and meat dishes such as shepherd's pie and meat loaf which would be insipid without it. Onion is also widely used in soups, pickles and cooked vegetable dishes, sauces, hearty casseroles, bean and lentil dishes (www. agricultural products india.com,2015).

Peeling, Cutting, Slicing and Chopping are considered as major unit operations involved in onion processing. At present cutting of onion is done by hand using knives in small restaurants and street fast food vendors for the preparation of various snack foods using onion. The sharpness of the blade plays a major role in peeling and cutting. Cutting of the produce with dull blades and knives causes bruising and damage to more tissue layer than intended. The sharpness of the knife blade affects the product storage life (Bolin and Huxsoll,1991).

The cutting of onion by hand is laborious, time consuming and causing much strain to hands and eye. The power operated onion slicer which are available at present will not serve the purpose of mobile street fast food vendors as they cannot get power supply wherever they go. Hence, a manually operated onion dicing tool onion dicing has been developed which will cater to the need of mobile street fast food vendors. The features and performance of onion dicing tool is explained in this research paper

Materials and methods

The design specification of hand operated onion dicing tool is given in Table 1. The dicing tool consists of two components namely a removable cutting grid of size 75x75 mm with slots of 8x8 mm size. Cutting of vegetables by using grid type cutting surface was developed and tested by Tony Thomas *et al.* (2014). A removable punch size 75x75 mm is provided with 8 mm thick protruding pegs to move into the slot during cutting. The unit is fixed over a suitable frame (Fig:1). The cutting punch is attached to a handle an important

component of the tool which works on the principle of lever mechanism and is used for transmitting the force required for cutting the fruit (Ambrish Ganachari *et.al.* 2008) is made up of mild steel shaft of 50mm diameter with adjustable length of 370-470 mm. The shaft is placed at a height of 465 mm from the bottom of the stand. The tool is provided with an inlet of 125 x 75 mm size on the side. The outlet has a detachable container of 105 x 75 mm size and kept below the cutting surface. The cutting die and punch are fixed in detachable form for cleaning as and when required. The polar and equilateral diameters of the onion used to determine the cutting surface of onion dicing tool. Out of total quantity of onion taken, peel accounted for 20%. The peeled onion was used for testing the dicing tool.

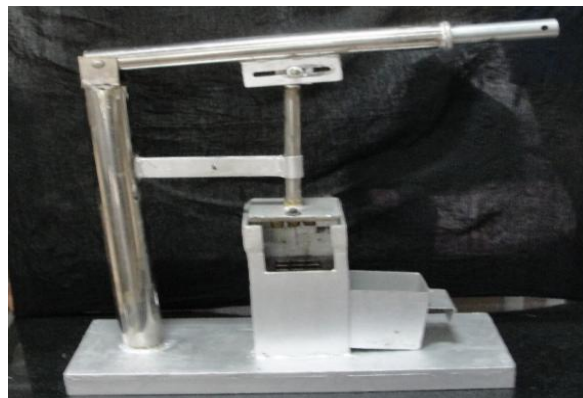
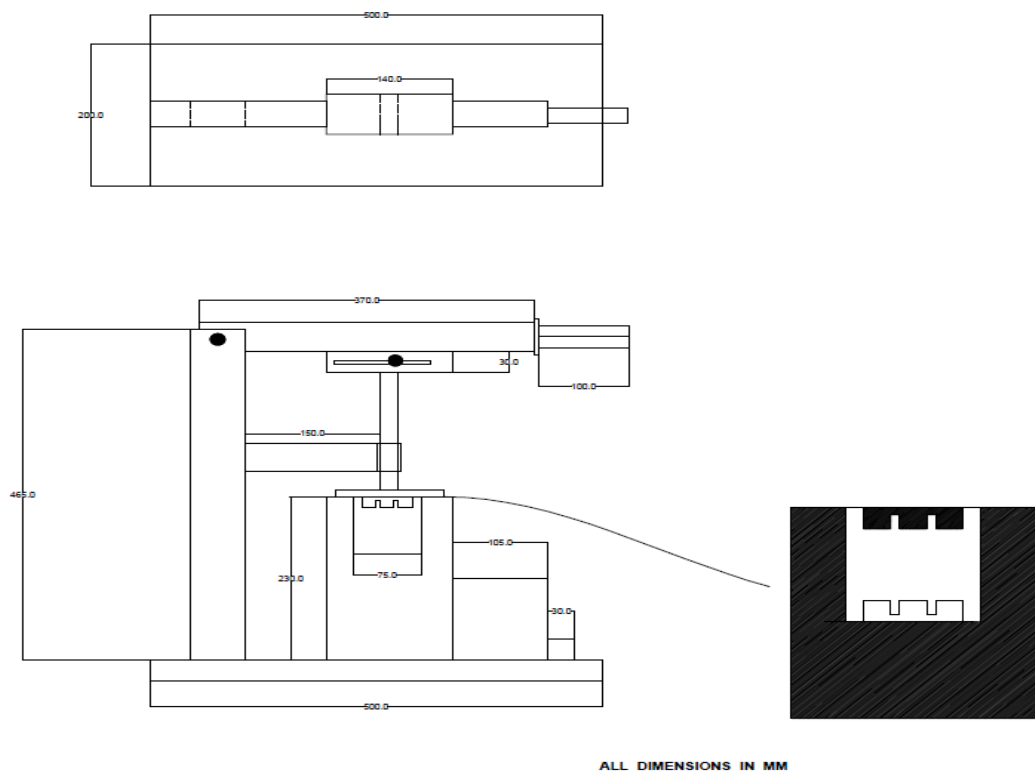


Fig:1. Onion dicing tool

The detailed specifications of the developed hand operated onion dicing tool is given in Table :1. The capacity of the hand operated onion dicing tool was found to be 60kg/h for the onion having polar diameter (60-65 mm) and equilateral diameter (50-55 mm). The tool was capable of making 9 onion dices each having size of 8x8 mm. The onion after peeling was subjected to dicing. Out of total quantity of onion taken, peel accounted for 20%. The peeled onion was used for testing the dicing tool.

Table: 1. Design specifications of the developed hand operated onion dicing tool

Parts	Dimension (LxB) (mm)	Cross section / Thickness (mm)
Handle	370	50 (dia)
Frame	465	4
Inlet	125 x 75	6
Cutting die	75 x 75	10
Removable punch	75 x 75	10
Outlet	105 x 75	2
Vertical pipe Stand	400 x 200	60 (dia)

Results and discussions

Performance Evaluation of the Tool

A portable onion dicing tool working on lever principle was evaluated for its comparative performance over conventional method by using plain sharp knife was done by engaging 50 and 28 years old women and 25 years old man. The performance of the developed onion dicing tool was evaluated based on its capacity, cutting efficiency, percent whole onion dices recovery, percent un diced onion (shreds) recovery. The economics of the developed tool was estimated by considering the cost of the raw materials, overhead charges and labour charges by using onion dicing tool and by conventional cutting method. The cost of operation was calculated by estimating the fixed cost and variable cost for onion dicing using tool in comparison with conventional method.



By dicing tool



By plain sharp knife

Fig.2 Comparative Performance evaluation of onion dicing tool

The mean cutting efficiency of the dicing tool was found to be 97.23 per cent having an average cut piece weight of 64g with the cut pieces of size 8 mm (approx). The diced onion was 97% and un diced onion was 2.5% (Fig.2). The developed tool could be easily operated even by women aged 50 years with dicing rate of 60kg/h compared to women aged 28 years 65kg/h and men aged 25 years 70kg/h. The cutting efficiency was higher than conventional method of cutting by hand using knife Moreover the operation of the tool is so simple and could be easily operated by middle aged women without any drudgery to the hands. The visual observation as well as the operators opinion about using dicing tool was that it did not give much strain to the eyes and hands during continuous onion dicing operation.

A hand operated tool for onion dicing was designed and developed. The developed onion dicing tool had a capacity of 60 kg/h. The efficiency of cutting of the tool was 97.23%. The cost of the tool was Rs. 5000/-. The cost saving in operation over conventional methods was 44% and time saving in operation over conventional method was 71%. This portable manual operated dicing tool will be convenient and beneficial for small restaurants and street food vendors.

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