

Original Research Article

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Study on Shelling Techniques of Sweet Corn

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ABSTRACT

The hand shelling using fingers remains the most favoured method for shelling of sweet corn cob kernels. The rate of hand shelling method is too low and also causes pain in the fingers used for plucking of the sweet corn kernel from the cob. It was observed in many cases the sweet corn kernels can be shelled by different techniques viz. shelling whole cob, shelling cob by breaking the cob across the length and shelling cob by splitting/paring the cob along the length. Therefore it was found necessary to study the shelling rate by these techniques. The three different sweet corn shelling techniques viz. Shelling whole cob (T1), shelling cob by breaking the cob across the length (T2) and shelling cob by splitting/paring the cob along the length (T3) were studied at Department of FMPE, Dr. D. Y. Patil College of Agricultural Engineering and Technology, Talsande Dist: Kolhapur in the Sept. 2017. A sweet corn cobs of Sugar-75 variety were used for the entire study. Corn shelling rate, Corn shelling capacity was studied. The average shelling rate (cobs/h) with technique T3 (51.14 cobs/h) was 5.17 and 3.6 times more than technique T1 and T2 respectively. The average shelling capacity (kg/h) with technique T3 (13.58 kg/h) was 5.16 and 3.6 times more than technique T1 and T2 respectively.

Keywords

Sweet corn, Shelling,
Corn shelling rate and
corn shelling capacity

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Introduction

Sweet corn shelling for domestic consumption or for sale as frozen corns, is very critical and time consuming operations. The hand shelling is one of the preferred methods for shelling of sweet corn kernels. In few of the cases the use of a knife or spoon handle for shelling of sweet corn kernels but the percentage of broken kernels is far beyond the acceptance level hence, the hand shelling with fingers remains the most favoured method for it. The rate of hand shelling method is too low and also causes pain in the fingers used for plucking of the sweet corn kernel from the cob. It was observed in many cases the sweet

corn kernels can be shelled by different techniques viz. shelling whole cob, shelling cob by breaking the cob across the length and shelling cob by splitting/paring the cob along the length. Therefore it was found necessary to study the shelling rate and shelling capacity of these techniques.

Materials and Methods

Measurement of dimensions of sweet corn cobs

The sweet corn cobs were dehusked and dimensions of dehusked sweet corn cobs were recorded before using for determination of

shelling rate, shelling capacity as well as splitting/paring rate as follows

Sweet corn cob length

The height of seedlings was measured by using a 30 cm scale. For measurement purpose, the dehusked sweet corn cobs were selected randomly and 10 observations were noted in each case to find the average.

Sweet corn cob stem diameter

Seedling stem diameter of uprooted seedlings of different ages was measured with the help of vernier calliper. Ten observations were recorded in each case to take the mean.

Seedling stem diameter was measured at a distance of 25 mm from the bottom end to maintain uniformity.

Techniques of hand shelling

Three different techniques for the hand shelling of sweet corn cob *viz.* Shelling whole cob (T1), shelling cob by breaking the cob across the length (T2) and shelling cob by splitting/paring the cob along the length (T3) were studied to identify the advantages and limitations of the different techniques.

In whole cob shelling technique (T1), the cob was broken across the length and shelling was done lengthwise by using fingers as shown in Figure 1a. In case of shelling the sweet corn cob by breaking it across the length (T2), the cob was broken across the length as in case of T1 and shelling was done by fingers by detaching the lines of kernels on the circumference of the cob as shown in Figure 1b. Whereas, in case of shelling cob by splitting/paring the cob along the length (T3), The whole sweet corn cob was splitted/parred using the screw driver and the shelling was done lengthwise by using fingers as shown in

Figure 1c.

Measurement of performance parameters

The performance of different techniques for the hand shelling of sweet corn cob was carried out in the Department of Farm Machinery and Power Engineering, D. Y. Patil College of Agricultural Engineering and Technology, Talsande Dist: Kolhapur in Sept 2017. The sweet corn cobs of Sugar-75 variety with average length of 193 mm and 50.9 mm average diameter were used for the study. The physical properties of the sweet corn cobs selected for the study are given in Table 1.

Corn shelling rate

The time required for 50 sweet corn cobs to shell completely with the three different sweet corn shelling techniques *viz.* Shelling whole cob(T1), shelling cob by breaking the cob across the length (T2) and shelling cob by splitting/paring the cob along the length (T3) was noted and the shelling rate was calculated by following formula,

$$\text{Corn shelling rate (cobs/hr)} = \frac{\text{Number of sweet corn cobs shelled}}{\text{Time, min}} \quad (1)$$

Corn shelling capacity

The weight of shelled sweet corn kernels in unit time is taken as corn shelling capacity. It was calculated for all the three different sweet corn shelling techniques *viz.* Shelling whole cob (T1), shelling cob by breaking the cob across the length (T2) and shelling cob by splitting/paring the cob along the length (T3) was noted and the corn shelling capacity was calculated by following formula

$$\text{Corn shelling capacity (kg/hr)} = \frac{\text{Quantity of shelled sweet corn kernels, Kg}}{\text{Time, min}} \quad (2)$$

Table.1 Physical properties of the sweet corn cobs selected for the study

| Cob No. | Length, mm | Diameter, mm | Weight of cob with kernels, gm | Weight of kernels, gm | Weight of shelled cob, gm |
|----------------|--------------|--------------|--------------------------------|-----------------------|---------------------------|
| 1 | 200 | 50 | 380 | 294 | 86 |
| 2 | 192 | 50 | 324 | 255 | 69 |
| 3 | 200 | 51 | 375 | 175 | 70 |
| 4 | 185 | 50 | 292 | 231 | 61 |
| 5 | 210 | 55 | 416 | 275 | 66 |
| 6 | 193 | 49 | 317 | 250 | 67 |
| 7 | 187 | 49 | 278 | 255 | 23 |
| 8 | 185 | 50 | 301 | 243 | 58 |
| 9 | 204 | 51 | 371 | 288 | 83 |
| 10 | 198 | 52 | 381 | 282 | 99 |
| Average | 195.4 | 50.7 | 333.7 | 265.5 | 68.2 |

Table.2 Observations of different techniques of sweet corn shelling

| Test | Time require to shell 25 dehusked sweet corn cobs | | | Shelling rate, cobs/hr | | |
|------------|---|---------------|----------------|------------------------|--------------|--------------|
| | T1 | T2 | T3 | T1 | T2 | T3 |
| I | 8940 | 6015 | 1780 | 10.07 | 14.96 | 50.56 |
| II | 9550 | 6445 | 1790 | 9.42 | 13.96 | 50.28 |
| III | 8805 | 6530 | 1710 | 10.22 | 13.78 | 52.63 |
| Avg | 9098.3 | 6330.0 | 1760.00 | 9.89 | 14.22 | 51.14 |

T1- Shelling whole cob, T2- Shelling by breaking across the length and T3- Shelling by splitting/paring along the length

Table.3 Observations of different techniques of sweet corn shelling

| Test | Time require to shell 25 dehusked sweet corn cobs, sec | | | Shelling capacity, kg/hr | | |
|------------|--|---------------|----------------|--------------------------|-------------|--------------|
| | T1 | T2 | T3 | T1 | T2 | T3 |
| I | 8940 | 6015 | 1780 | 2.67 | 3.97 | 13.42 |
| II | 9550 | 6445 | 1790 | 2.50 | 3.71 | 13.35 |
| III | 8805 | 6530 | 1710 | 2.71 | 3.66 | 13.97 |
| Avg | 9098.3 | 6330.0 | 1760.00 | 2.63 | 3.78 | 13.58 |

T1- Shelling whole cob, T2- Shelling by breaking across the length and T3- Shelling by splitting/paring along the length



a) Shelling whole cob (T1)



b) Shelling cob by breaking the cob across the length (T2)



c) Splitting/paring the cob along the length (T3)

Fig.1 Different techniques for the hand shelling of sweet corn cob

Fig.2 Shelling rate of different techniques of sweet corn shelling

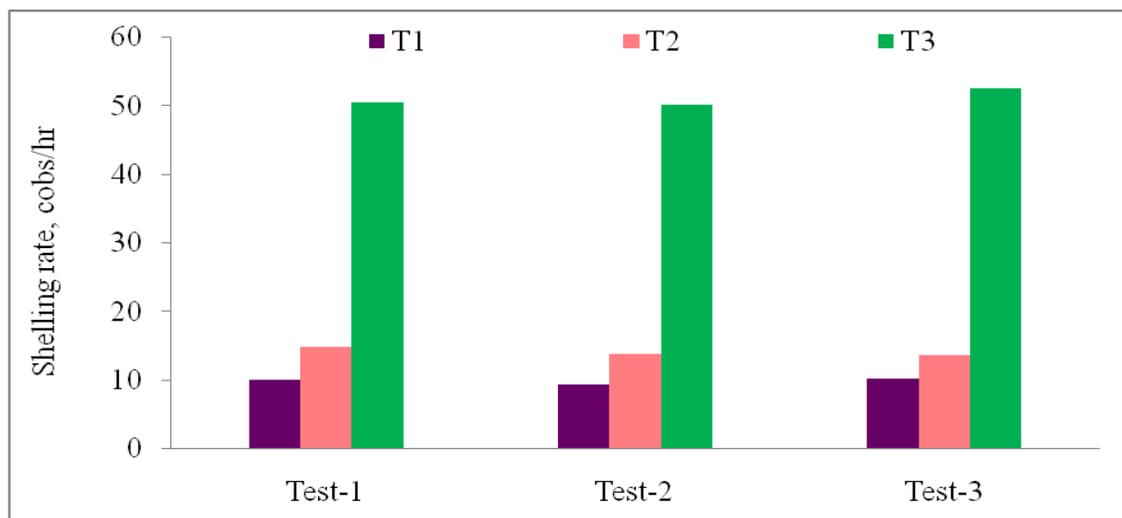
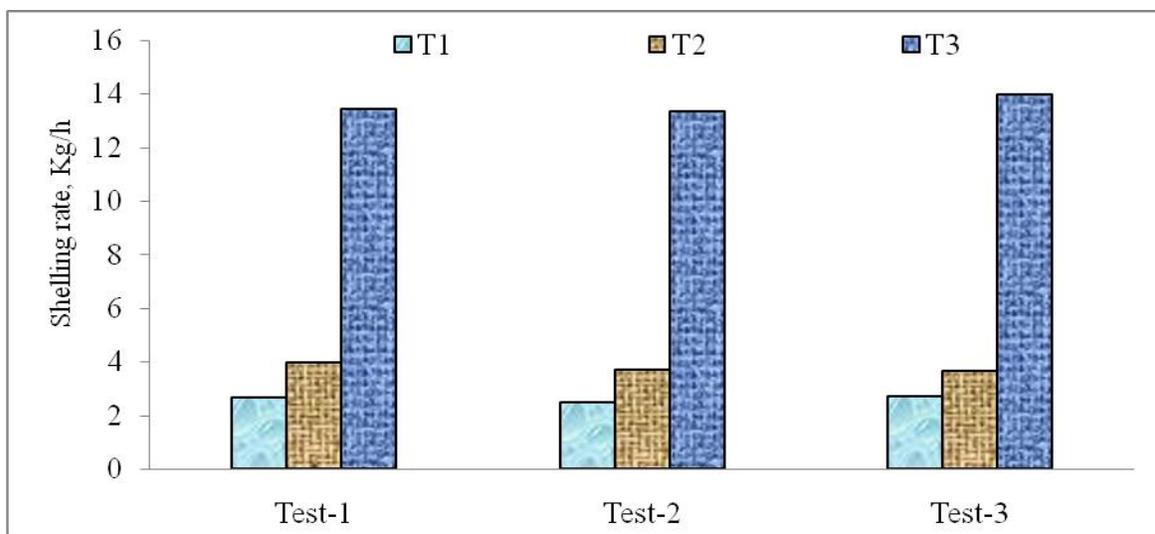


Fig.3 Shelling capacity of different techniques of sweet corn shelling



Sweet corn cob splitting/paring rate

The time required for 25 sweet corn cobs to split/par by manual method using screw driver and by using sweet corn cob splitting/paring machine was noted and the sweet corn cob splitting/paring rate was calculated by following formula,

$$\text{Sweet corn cob splitting/paring rate (cobs/hr)} = \frac{\text{Number of cobs splitted/pared}}{\text{Time, min}} \quad (3.3)$$

Results and Discussion

Corn shelling rate

The average values of corn shelling rate obtained with the three different sweet corn shelling techniques are presented in Table 2. The comparative corn shelling rate obtained with the three different sweet corn shelling techniques is presented by Figure 2. It can be seen from the Table 2 and Figure 2 that the highest corn shelling rate calculated as

number of cobs/h was obtained with treatment T3 followed by T2 and T1.

The average shelling rate (cobs/h) with technique T3 was 5.17 and 3.6 times more than technique T1 and T2 respectively. The highest shelling rate in case of technique T3 was mainly due to the small size of cob which offered grip in holding the splitted/pared cob and ease of shelling of kernels from either side rows of kernels.

Corn shelling capacity

The average values of corn shelling capacity obtained with the three different sweet corn shelling techniques are presented in Table 3. The comparative corn shelling capacity obtained with the three different sweet corn shelling techniques is presented by Figure 3. It can be seen from the Table 3 and Figure 3 that the highest corn shelling capacity calculated as number of kg/h was obtained with treatment T3 followed by T2 and T1.

The average shelling capacity (kg/h) with technique T3 was 5.16 and 3.6 times more than technique T1 and T2 respectively. The highest shelling capacity in case of technique T3 was mainly due to the small size of cob which offered grip in holding the splitted/pared cob and ease of shelling of kernels from either side rows of kernels.

The average shelling rate (cobs/h) with technique T3 (51.14 cobs/h) was 5.17 and 3.6 times more than technique T1 and T2 respectively. The average shelling capacity (kg/h) with technique T3 (13.58 kg/h) was 5.16 and 3.6 times more than technique T1 and T2 respectively.

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