



Study on the Comparative Evaluation of Cashew Nut Shellers

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ABSTRACT

Cashew nut recovery remains major concern in the cashew nut production. The hand operated portable cashew nut sheller was developed on the principle of shearing. The comparative performance was tested for hand operated cashew nut sheller, hand and foot operated sheller and manual shelling, the test results showed that hand operated sheller can shell 2.32 kg cashew/hr with the whole kernel recovery of 86.26 per cent. The per cent whole kernel recovery for new sheller was 86.26, while that for foot pedal operated sheller was 80.1 and hand shelling was 71.0.

Keywords: Cashew Nut, hand operated cashew nut sheller, hand and foot operated sheller

INTRODUCTION

In India only 1.2 % of the total Horticultural product is processed. The losses of fruits and vegetables are more than 30% due to non-availability of cheaper and adaptable technology for the farmers. Processing of cashew nut can be defined as recovery of the kernel from raw nuts by manual/mechanical means. It consists of moisture conditioning, roasting, shelling, drying, peeling, grading and packing. If output of cashew nut shelling is not as whole kernel, price of kernel decreases rapidly (Dhemre *et al*, 2016 and Kad *et al*, 2017). The shelling aspect is mainly important for improving the kernel price by recovering whole kernel from the raw cashew nut (Jain *et al*, 2004).

In manual shelling process, nuts are placed on a flat stone and cracked with wooden mallet. Because some CNSL (Cashew Nut Shell Liquid) still adheres to the shell, the sheller has to protect his hands with gloves, for this nut may be dusted with wood ash. The cashew nut sheller on principle of centrifugal force was found out to be of processing capacity of 18 kg/hr with end product of 70 per cent shelling efficiency. The output of the machine was 50 per cent whole, 22 per cent split and 28 per cent broken. The semi-mechanized process uses a pair

of knives, each shaped in the contours of the half a nut. When the knives come together by means of foot-operated lever, they cut through the shell all around the nut, leaving the kernel untouched. Two person work at each table; the Sheller cuts the nuts and second person opens them and separated kernel and shell. The nuts have to be calibrated in to various sizes, each size matching a pair of knives of appropriated size. Daily production is about 15 kg of kernels per team. Low cost cashew nut cracker developed by Ajav (1996). Thivavarnvongs *et al* (1995) evaluated optimum cashew nut pre-shelling treatment as being 30 min boiling time and 24 h drying time, with a sizing method based on width and thickness parameters producing average whole-kernel recovery of 82.7%. Nalawade *et al* (2007) developed hand operated portable cashew sheller based on properties of Indian cashews determined by Aware *et al* (2007). Ojolo and Ogunsina (2007) developed a prototype cashew nut cracking device. The machine was tested with various cashew nut sizes (30.40 mm in mean length) and placement orientations. Uchiyama *et al* (2014) presented an automatic cashew shelling system, which mainly involved the vibrating cashew feeder, conveyor belts, rollers, cashew milling cutter, and cashew

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Table 1. The test results and economics of the different methods of cashew nut sheller

| Sr. No. | Particular | H O* | H F O* | M* |
|---------|---|--------|--------|-------|
| 1 | Quantity of Cashew nuts, Nos. | 500.83 | 738 | 175 |
| 2 | Quantity of Cashew nuts, kg/hr | 2.90 | 4.58 | 0.90 |
| 3 | Time required for the shelling the cashew nuts, min | 75.50 | 68.67 | 60 |
| 4 | Whole kernel recovered, nos. | 434.17 | 589 | 123 |
| 5 | Half Split kernels, nos. | 53.17 | 66 | 18.67 |
| 6 | Broken nuts, nos. | 13.50 | 82.67 | 33.17 |
| 7 | Cost of Initial machine (Rs.) | 100/- | 1500/- | 20/- |
| 8 | Operating cost (Rs/kg) | 2.98 | 5.50 | 9.10 |

*H O = Hand Operated, H F O = Hand and Foot Operated, M = Manual Operated

shell splitter. Fu *et al* (2015) proposed an adaptive cashew shelling cutter, consisting of the fixing frame, spring, tool holder, upper cutter, lower cutter and scraper.

MATERIALS AND METHODS

The scissor like equipment was developed that can cut the outer shell without injury to the kernel and open the shell by further movement of the levers. Synchronous operations of cutting and opening of outer shell in single action could eliminate the action of foot and hand together. Experiment includes hand operated cashew nut sheller (H O), hand and foot operated cashew nut sheller (H F O) and manual operated sheller (M). The tests were carried out at six different locations to get the operators feedback about the machine. Each test was carried out with view to observe the maximum shelling of the nuts. The nuts were previously steamed and dried for one day before testing of the machines. While for the manual shelling the drum roasted nuts were used.

The tests were conducted on hand operated cashew nut sheller and hand and foot operated cashew nut sheller to determine its shelling capacity, shelling efficiency (η), per cent broken nuts (B), per cent half split nuts (H) and per cent whole recovery (W).

RESULTS AND DISCUSSION

The results of the tests conducted are shown in table 1. Average shelling capacity of the hand operated cashew nut sheller, hand and foot operated cashew nut sheller and manual operation was observed as 2.9, 4.58 and 0.9 kg/hr, respectively.

The cost of operations was Rs. 2.98, Rs. 5.5 and Rs. 9.1 for manual shelling, hand and foot operated sheller and hand operated sheller, respectively. Initial cost of the manual sheller was less the operating cost was lower than other two methods the sheller found to be economical (Table 1). The hand operated machine is economical for small scale production as compared to hand and foot operated machine as well as manual shelling.

Table 2. Comparison of recovery (%) and machine capacity of three methods

| Treatment | Whole kernels recovery (%) | Half split (%) | Broken (%) | Machine capacity (kg/hr) |
|------------------------------|----------------------------|----------------|------------|--------------------------|
| H O (Hand Operated) | 86.257 | 10.598 | 3.147 | 2.318 |
| H F O (Hand & Foot Operated) | 79.840 | 8.947 | 11.210 | 4.005 |
| M (Manual Operated) | 70.418 | 10.615 | 18.967 | 0.903 |
| CD (p=0.05) | 2.586 | NS | 1.549 | 0.155 |

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The shelling capacity of hand-foot operated sheller was more than that hand-operated sheller (Table 2). Whole kernel recovery for new sheller was 86.26 per cent, that for foot pedal operated sheller 79.84 per cent and hand shelling was 70.42 per cent. The per cent half split was found at par in all machines where as broken nuts in case of hand operated sheller was significantly less than that of hand and foot operated sheller and manual shelling.

CONCLUSION

The comparative trials showed that the percentage whole kernel recovery for hand operated sheller was 86.26 per cent followed by foot pedal operated sheller as 80.10 per cent and hand shelling as 71.00 per cent. The per cent half split and broken nuts in case of hand operated sheller were comparatively less than that of foot pedal operated sheller and hand shelling. The hand operated machine is more economical for small scale production as compared to hand foot operated machine as well as manual shelling.

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