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Testing and evaluation of Pedal operated potato peeler

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■ **ABSTRACT :** The pedal operated potato peeler (CIAE model) was tested for its performance. The performance evaluation of machine was carried out in terms of machine capacity, peeling efficiency, operational cost, benefit cost ratio and payback period. The capacity and peeling efficiency of the machine were 144 kg/h and 83%, respectively. The machine capacity and peeling efficiency were highly affected by weight of potato per batch and operational time of the machine. For maximum capacity (144 kg/h) and peeling efficiency (85.8%), the weight of potato per batch and operational time were 6 kg and 2.5 min, respectively. The operational cost of the machine was Rs. 74.77/h. The benefit cost ratio and payback period were 1.72 and 0.33year (4 months), respectively. The pedal operated potato peeler would be suitable for farmers as well as small entrepreneurs.

■ **KEY WORDS :** Machine capacity, Peeling efficiency, Operational cost, Benefit cost ration, Potato

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Potatoes (*Solanum tuberosum* L.) are one of the post important staple crop for human consumptions, together with wheat, rice and corn (Schieber and Saldana, 2009). The other major producers are West Bengal, Bihar, Punjab, M.P., Gujarat and Assam (Directorate of Economics and Statistics, Government of India, 2011-12). Peeling of vegetables and fruits is one of the most frequent operations at hotels, canteens and restaurants even at house hold purposes. Potato is probably the most popular food and widely consumed item in the Indian diet (Talodhikar *et al.*, 2017). The inhibition effect of the extract of peel of potato on the corrosion of mild steel in potable water have been studied by using an electrochemical polarization and weight loss method (Hamzah, 2017). Potato peel waste (PPW) is not suitable for non-ruminants without further treatment because it is too fibrous to be digested (Birch *et al.*, 1981).

All new potato varieties are grown from seeds, also called “true potato seed”. There are about 5,000 potato varieties worldwide. The major species grown worldwide is *Solanum tuberosum*, and modern varieties of this species are the most widely cultivated. Potatoes are generally grown from seed potatoes – these are tubers specifically grown to be disease free and provide consistent and healthy plants. To be disease free, the areas where seed potatoes are grown are selected with care. Storage facilities need to be carefully designed to keep the potatoes alive and slow the natural process of decomposition, which involves the breakdown of starch. It is crucial that the storage area is dark, well ventilated and for long-term storage maintained at temperatures near 4 °C (39 °F). For short-term storage before cooking, temperatures of about 7 to 10 °C (45 to 50 °F) are preferred (Berzok and Murray, 2003).

It remains an essential crop in Europe, where per capita production is still the highest in the world, but the most rapid expansion over the past few decades has

occurred in southern and eastern Asia. As of 2007 China led the world in potato production, and nearly a third of the world's potatoes were harvested in China and India. (FAO, 2008)

In India Uttar Pradesh, West Bengal, Bihar, Gujarat, Madhya Pradesh, Punjab, Assam, Karnatka, Haryana and Jharkhan are top ten state in potato production. Uttar Pradesh, West Bengal, Bihar, Gujarat, Madhya Pradesh, Punjab, Assam, Karnatka, Haryana and Jharkhan share 31.82%, 25.56%, 14.64%, 5.51%, 5.07%, 4.70%, 2.15%, 1.54%, 1.49% and 1.45% in potato production (National Horticulture Board 2013). The total annual production of potatoes in India is about 15 million tons and a substantial amount of it is lost at various stages of post harvest operations, mainly due to inadequate storage facilities (Subrahmanyam, 1986). China and India accounted for over a third of world's production in 2010, and had yields of 14.7 and 19.9 tons per hectare, respectively. Potato crop yields are determined by factors such as the crop breed, seed age and quality, crop management practices and the plant environment. Improvements in one or more of these yield determinants, and a closure of the yield gap, can be a major boost to food supply and farmer incomes in the developing world (Foley and Ramankutty, 2011). The product quality, processing efficiency, minimum loss of tubers and increased processing rate will be affected by improved cassava peeling process (Egbeocha *et al.*, 2015). The testing of the machine recorded a peeling efficiency of 94% which is a remarkable improvement over the previous peelers review (Ogunlowo *et al.*, 2016). Moreover, the loss of flesh is very high. However, the potato processing industry uses lye peeling. Since, in lye peeling process, the heat ring is formed below the surface of the potato due to tissue damage and polyphenol enzyme activity, it is not recommended for making the chips. For this purpose, abrasive type potato peelers have been recommended (Singh and Shukla, 1995).

METHODOLOGY

The work was carried out in the fruit and vegetable processing pilot plant, Department of Processing and Food Engineering, COAE&T, CCS HAU, Hisar. The project was planned to evaluate the performance of the pedal operated potato peeler machine.

Pedal operated potato peeler :

The pedal operated potato peeler was purchased from Central Institute of Agricultural Engineering (CIAE), Nabibagh, Berasia Road, Bhopal. It consists of two number of perforated stainless steel drums during rotation remove skin of potatoes as in manual peeler. The main part of the peeler is an abrasive drum, made of stainless steel sheet. The inside surface of the drum has protrusions. To develop the protrusions, the stainless steel sheet was bent into a cylindrical shape and it was punched from one side with a die at a fixed spacing. It was then filed to flatten the sharp points developed from punching to ensure smoother peeling of the potatoes. The drum is fixed on a horizontal shaft supported by two ball bearings fixed over a frame of size 1200 x400 x 800 mm. For loading and unloading the unpeeled and peeled potatoes, respectively, an inlet and outlet have been provided. The abrasive peeling takes place due to the movement of the potatoes inside the rotating drum. The drum is rotated by pedals. A water spraying unit of galvanized iron (GI) pipe having nozzles to remove peels from the drum and simultaneously wash the peeled potatoes.

Fig. A : Pedal operated potato peeler

Machine capacity and peeling efficiency :

$$\text{Machine capacity (kg/hr)} = \frac{\text{Weight of potato, kg}}{\text{Total time taken, min}}$$

$$\text{Peeling efficiency (\%)} = 1 - \frac{\text{Weight of unpeeled potato, kg}}{\text{Total weight potato, kg}}$$

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Table 1 : Effect of peeling time on machine capacity and peeling efficiency

Sr. No.	Process parameters		Performance parameters	
	Weight of potato/ batch (kg)	Time (min.)	Machine capacity (kg/h)	Peeling efficiency (%)
1.	6	2	180	48.3
2.	6	2.5	144	85.8
3.	6	3	120	87.4

Performance of pedal operated potato peeler :

Potatoes were fed into each perforated stainless steel drums of pedal operated potato peeler machine for the performance evaluation. Preliminary experiments were carried out and optimized process parameter (time taken for peeling) while per batch input of potato was takes as fixed parameter for maximum machine capacity and minimum peeling losses. Each experiment was carried out in three replications. The pedal operated peeler was evaluated three level of peeling time. The level of peeling time and constant weight of potato for testing and results are as follows:

Table 1 shows the effect of peeling time on performance parameters. It can be seen from table that 3 minutes of peeling time gave the highest peeling efficiency of (87.4%), followed by 2 minute of peeling time (48.3%) and 2.5 minutes of peeling time (85.8%). Similarly, 3 minutes of peeling time gave the lowest machine capacity of (120 kg/h) followed by 2 minute of peeling time (180 kg/h) and 2.5 minutes of peeling time (144 kg/h).

After complete evaluation and analysis of all parameters in terms of maximum machine capacity and peeling efficiency, it was found that the best performance of pedal operated potato peeler machine for maximum machine capacity (144 kg/h) and peeling efficiency (85.8%) at the input weight of potato per batch (6 kg) and peeling time (2.5 minutes). The operational cost of the machine was Rs. 74.77/h. The benefit cost ratio and payback period were 1.72 and 0.33year (4 months), respectively.

Conclusion :

The pedal potato peeler was tested for its performance. The output capacity and peeling efficiency were found as 144 kg/hr and 85.8%, respectively. The operational cost of the machine is Rs. 74.77/hr. The benefit cost ratio and payback period are 1.72 and 0.33 year (around 4 months), respectively. For maximum capacity (144 kg/h) and peeling efficiency (85.8%), the weight of potato per batch and operational time were 6 kg and 2.5 minutes, respectively.

REFERENCES

Berzok and Murray, L. (2003). *Encyclopedia of food and Culture*.

Birch, G.G., Blakebrough, N. and Parker, K.J. (1981). *Enzymes and food processing*. Applied Science Publishers, London, UK, pp. 296.

Egbeocha, C.C., Asoegwu, S.N. and Okereke, N.A.A. (2015). A review on performance of cassava peeling machines in Nigeria. *Futojnls*, 2 (1) : 140-168

FAO (2008). *Potato world*. Retrieved 21 December 2014.

Foley and Ramankutty (2011). Solutions for a cultivated planet. *Nature*, **478** (7369) : 337-342.

Hamzah, A.F. (2017). Extract of peel of potato as an inhibitor for the corrosion of mild steel in potable water. *Internat. J. Adv. Res. Computer Sci. & Mgmt.*, **3**(11) : 52. ISSN 2320-9135.

Ogunlowo, S., Olaleye, S.A. and Fasunla, M.S. (2016). Performance evaluation of the automated system for cleaning, peeling and washing cassava tubers. *Internat. J. Adv. Agric. & Environ. Engg.* (IJAAEE), **3** (2):(2016) ISSN 2349-1523 EISSN 2349-153.

Schieber, A. and Saldana, M.D.A. (2009). Potato peels: A source of nutritionally and pharmacologically interesting compounds- A review. Food **3** (special issue-2), *Global science book*. pp. 23-29.

Singh, K.K. and Shukla, B.D. (1995). *Abrasive peeling of potatoes. Food engineering*, 436 pp.

Subrahmanyam, K.V. (1986). Post harvest losses in horticultural crops: an appraisal. *Agric. Situ. India*, **41** : 339-343.

Talodhikar, V.P., Gorantiwar, V.S. and Dhole, L.P. (2017). Mechanization and development of potato peeling machine: A review. *I. J. Engg. & Innovative Technol. (IJEIT)*, **6** (9) : 38-40.

WEBLOGRAPHY

National Horticulture Board (2013). http://agriexchange.apeda.gov.in/India%20 Production/ India_ Productions.aspx ?hscode=07019000.