

Mechanisation of Juice Extraction Process of Natural Aloe Vera (*Aloe Barbadensis* Miller) for Small and Medium Enterprises

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Abstract

Aloe Vera (*Aloe barbadensis* Miller) is the world best traditional medicine used in food, cosmetics, and healthcare industries. Peeling and blending is crucial steps for processing Aloe Vera juice. But unavailability of the suitable processing equipment is the main constraints in small and medium enterprises (SME). The research was to design and develop a hand operated peeling tool (HOPT) and a manual juice extractor (MJE) for SME. The study was consisted of design, fabrication, testing and performance evaluation. HOPT was fabricated and comparatively assessed with knife to evaluate gel recovery, peeling speed, residual gel, input and output capacity of unskilled labor. Processed defective units (DU) in gel expulsion method were determined according to the presence of green patches on extracted gel. Data was analyzed by T-Test and chi-square test at $P < 0.05$. The performance parameters; gel recovery, peeling speed, input capacity and output capacity were significantly higher in HOPT compared to knife peeling. HOPT showed 51.37% of time saving and 5% lower residual gel on peels compared to knife peeling. DU was significantly lower ($P < 0.05$) in HOPT compared to the knife peeling. MJE was fabricated and tested for two sieve diameters (SD) of 2mm and 1mm and extraction efficiency, juice recovery, extraction loss, extraction rate and input capacity was assessed. Data were analyzed by one-way ANOVA at $P < 0.05$. The performance of 1 mm SD showed higher values in extraction efficiency and juice recovery with significantly lower extraction loss but the extraction rate and input capacity values were higher in 2 mm SD. Manufacturing cost of the MJE and HOPT are Rs. 24,047.01 and Rs. 6,198.23, respectively. Estimated total juice extraction cost is Rs. 37.96 per kg of gel using MJE. The Gel expulsion cost of HOPT and knife was calculated as Rs. 2.18, Rs. 4.37, respectively. MJE and HOPT are cost effective solutions for SME.

Keywords: Aloe Vera, Manual juice extractor, Peeling tool, Small and medium scale processors

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