

ABSTRACT

This study mainly aimed to find an alternative to the equipments, in use for size classifying black pepper. A manually-operated flat tray sieve was evaluated by screening black pepper to reduce the content of fines in the tailings to 20, 15, 10, and 5 per cent. The output, when reducing screening inaccuracy to five per cent, was 18.2 kg per man-h, and the unit cost of sieving, Rs 1.38 per kilogram of black pepper. This projected the low capacity and high unit cost of this method. The evaluation conducted on an oscillating flat screen, for four screening durations at two feed compositions, three oscillation frequencies, and three feed rates, gave its lowest level of screening inaccuracy as 15.6 per cent only. It confirmed that this screen was incapable of providing the desired low level of screening inaccuracy of five per cent. Clogging was also seen to be cumulative and severe. Another investigation conducted with an experimental set-up comprising three hexagonal trommels having six internal flights studied the effects of feed composition (0.150, 0.325, 0.500, 0.675), feed rate (60, 90, 120, 150 kg/h), and trommel speed (10, 15, 20, 25 r/min) on screening inaccuracy, zone-wise screening percentage of fines, clogging index, and power requirement. It showed that higher feed compositions, and lower feed rates and trommel speeds were necessary for obtaining lower screening inaccuracies. Screening inaccuracies below five per cent could be achieved with the hexagonal flighted-trommels generally at a feed rate of 90 kg/h and trommel speed, 15 r/min, when the feed composition was 0.675. The highest zone-wise screening percentage occurred in the first 15-cm zone from the inlet. Clogging was seen to be not a major problem; the clogging index being only in the range 0.02-0.25 % because of the self-cleaning characteristics of the trommels. Power requirement was also found to be of a very low order (0.7-1.1 W) when producing screening inaccuracies of 5 per cent and below. The unit cost of sieving was Rs. 0.40 per kilogram of black pepper at the feed rate, 90 kg/h. Semi-empirical and empirical models developed could predict screening inaccuracy of a hexagonal flighted-trommel in terms of feed composition, feed rate, and trommel speed. The investigation showed that the hexagonal flighted-trommel was an effective alternative to the existing equipments for meeting the specific requirement of purity in grade.

Key words: Trommel, Hexagonal trommel, Trommel screen, Flighted-trommel, Hexagonal flighted-trommel, Black pepper, Size classification, Size grading, Sizing, Screening, Sieving, Grading, Screening accuracy, Screening inaccuracy, Clogging, Clogging index, Oscillating screen, Mechanical separation.