

ABSTRACT

Development of a Machine to Crack Nutmegs of Variable Seed Diameters

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Over the past twenty-five (25) years there has been very little change in nutmeg processing. Grenada, as most Caribbean countries, is faced with increasing economic problems, and as a result more emphasis is being placed on increased production in the agricultural sector as a solution. Mechanised processing of nutmegs could be a major means of increasing overall production and maximising profitability in the nutmeg industry.

In this thesis, existing nutmeg cracking systems are discussed and a machine for cracking nutmegs of variable seed diameters is developed. Improvements of the machine are discussed and adaptation of the machine for large-scale processing of nutmegs in a labour intensive industry is considered.

The principle of the machine operation is based on horizontal, divergent rotating rolls for seed cracking. A similar roll arrangement

placed directly over the cracking rolls enable a sorted output of nutmegs falling directly into an appropriate spacing for cracking on the cracking rolls. Initial testing used spirals on the horizontal sorting drums for feeding of nutmegs horizontally along the drums, the cracking rollers used initially comprised of one cracking roll knurled, with the other being smooth. Tests revealed best cracking efficiency of $n_1 = 78\%$, an overall cracking efficiency of $n_2 = 90\%$ and a relatively low damage ratio, $R_1 = 3\%$. However, the average processing time for the machine was extremely low, in most cases over 90 seconds/seed.

Based on limitations of the machine used in the initial testing, the spirals were removed and the sorting rollers were polished and inclined at an angle of 10° to the horizontal to allow for gravitational feeding. Both cracking drums were then rubberlined to reduce the quantity of damaged kernels. Tests revealed best cracking efficiency of $n_1 = 74.9\%$, an overall cracking efficiency of $n_2 = 82\%$ and a damage ratio of $R_1 = 9\%$. Although efficiencies were slightly lower than before, processing time of the machine per seed was improved to 5 seconds.

In the modified machine the ratio of damaged kernels to good kernels (R_1) was 0.09, which compares favourably with present processing operations in Grenada — this being 0.12 at the Gouyave and 0.13 at the Grenville processing stations.