Freeze-thaw Pre-treatment Optimization for Cassava Tubers to improve Peeling Efficiency

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Introduction

• Cassava peeling is a very important operation step in cassava processing.
• Different shapes and sizes of cassava tubers are the major challenges in cassava peeling.
• The main objective of this study was to investigate the effect of freeze-thaw pre-treatment (FTP) on the mechanical peeling process of cassava tubers.

Material and Methods

• The operational parameters were rotational speed of brushes (550 - 1150 rpm), peeling time (1 - 5 min), thaw temperature (50 - 90 °C) and time of thawing (0 - 120 s).
• Response surface methodology using central composite design was applied to optimize FTP to improve the cassava peeling process.
• Peeled surface area (PSA) and peel loss (PL) were measured as the responses.

Results

• After 30 runs in the central composite design, multivariate correlation was established through reduced cubic model with $R^2$ of 0.89 and 0.99 for PSA and PL, respectively.

• Results reveal that PSA and PL were significantly ($p < 0.05$) influenced by rotational speed of the brushes, peeling time and incubation time (Fig. 2).
• Under optimal peeling conditions, rotational speed of 1000 rpm, peeling time of 3.4 min, thawing temperature of 59 °C and incubation time of 90 s, the PSA and PL was 99.5 % and 19.0 %, respectively.
• It was found that the freeze-thaw pre-treatment had no negative effect on the quality of cassava tubers.

Conclusions

• The results show that the application of FTP by optimizing the ratio of PSA and PL can improve the peeling process of cassava tubers.
• For further studies, the economic feasibility of the freeze-thaw pre-treatment for practical application should be studied.