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## Comparison of Freeze-thaw and Enzymatic Pre-Treatments to Improve Peeling Process of Cassava Tubers

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### Abstract

Peeling is still considered as a main problem of cassava processing due to irregular shapes and sizes of cassava tubers. Different peeling methods comprising manual, mechanical, chemical and thermal methods to improve peeling process of cassava tubers have been reported. In this study, the effect of two different pre-treatments including freeze-thaw and enzymatic pre-treatment on the peeling process of cassava tubers was investigated and compared. A prototype cassava peeling machine, which had been constructed at University of Hohenheim, was used to peel the cassava tubers. Response surface methodology (RSM) was applied to optimise the freeze-thaw and enzymatic pre-treatment to increase the peeling performance. The variables were thaw temperature, thaw incubation time, peeling time and rotational speed in freeze-thaw pre-treatment and enzyme dose, incubation time and peeling time in enzymatic pre-treatment. Peeled surface area (%) and peel loss (%) were determined as the main responses, whereas multivariate correlations were well established through polynomial models. As a result, peeled surface area and peel loss were significantly influenced by freeze-thaw pre-treatment and enzymatic pre-treatment ( $p < 0.05$ ). Under an optimal peeling condition, the peeled surface area and peel loss was 94.9% and 21.7% for freeze-thaw and 89.52% and 24.61% for enzymatic pre-treatment, respectively. Freeze-thaw pre-treatment could result in a higher peeled surface area than enzymatic pre-treatment, but also lead to a syneresis phenomenon that influenced the quality of the tubers in terms of texture and water content. On the other hand, enzymatic pre-treatment could increase the detoxification of the peels by hydrolysis. Application of both freeze-thaw and enzymatic pre-treatment can improve the peeling process of cassava tubers, but would add extra costs for cassava processing. The feasibility of these methods at industrial scale should be further investigated.

**Keywords:** Biochemical pre-treatment, cassava peeling, peeling efficiency, Response surface methods, thermal pre-treatment