

INSTITUTE OF AGRICULTURAL ENGINEERING **Tropics and Subtropics Group**

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

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Problem and Objective

- Peeling is still considered as a main problem of cassava processing due to irregular shapes and sizes of cassava tubers.
- The main objective of this study was to investigate and to compare the effect of two different pre-treatments including freeze-thaw and enzymatic pre-treatment on the peeling process of cassava tubers.

Material and Methods

• A prototype cassava peeling machine constructed at the University of Hohenheim was used to peel cassava tubers.



Results

- Under an optimal peeling condition, the PSA and PL was 94.9% and 21.7% for freeze-thaw and 89.5% and 24.6% for enzymatic pre-treatment, respectively.
- Freeze-thaw pre-treatment could result in a higher PSA 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.
- pre-treatment enzymatic could increase the detoxification of the peels by hydrolysis.



Response surface methodology (RSM) was applied to optimize the freeze-thaw and enzymatic pre-treatment to increase the peeling performance.

Table 1.	Independent	variables	of	RSM
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Freeze-thaw pre-treatment			Enzyme pre-treatment		
Thaw temperature (°C)	Thaw incubation time (s)	Peeling time (min)	Enzyme dose (mL g⁻¹)	Incubation time (h)	Peeling time (min)
50-90	30-90	1-5	0.5-1.2	1.5-6.5	1.5-4.5

Fig. 2 Peel loss (PL) of cassava tubers after freeze-thaw pre-treatment (a) and enzyme treatment (b).



Fig. 3 Peeled surface area (PSA) of cassava tubers after freeze-thaw pretreatment (c) and enzyme treatment (d).

• Peeled surface area, PSA (%) and peel loss, PL (%) were determined as the main responses.

$$PSA = \frac{A_1}{A_2} \cdot 100$$



□ *PSA* : peeled surface area (%) after peeling process \Box A_1 : area of the removed peel on cassava tuber surface (cm²) \square A_2 : area of whole cassava tuber surface (cm²)

 \square *PL* : peeling loss (%) after peeling process \square m_1 : mass of unpeeled cassava tuber (g) \square m_2 : mass of peeled cassava tuber (g)

Conclusions

- Application of both freeze-thaw and enzymatic pre-treatment can be effective to improve the peeling process of cassava tubers.
- The feasibility of these methods at industrial scale should be further investigated.



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