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ULTRASOUND-ASSISTED EXTRACTION OF CAROTENOIDS FROM MACAUBA PULP AND PULP PRESS-CAKE USING ETHYL ACETATE

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INTRODUCTION & AIM

The macauba (*Acrocomia aculeata*) is a palm native to Brazil. The pulp (MP) of the fruit is notable for its high content of oil, dietary fiber, and carotenoids. After oil extraction, the pulp press-cake (PPC) is obtained, which can be used in animal feed due to its nutritional value and the absence of antinutritional factors. Both MP and PPC contain carotenoids, bioactive compounds that can be extracted. Conventional extraction methods use toxic solvents such as hexane, acetone, and petroleum ether, which are harmful to the environment and human health. This study aimed to optimize the extraction of carotenoids, promoting sustainability by using ethyl acetate, a Generally Recognized as Safe (GRAS) solvent, combined with the use of ultrasound.

METHOD

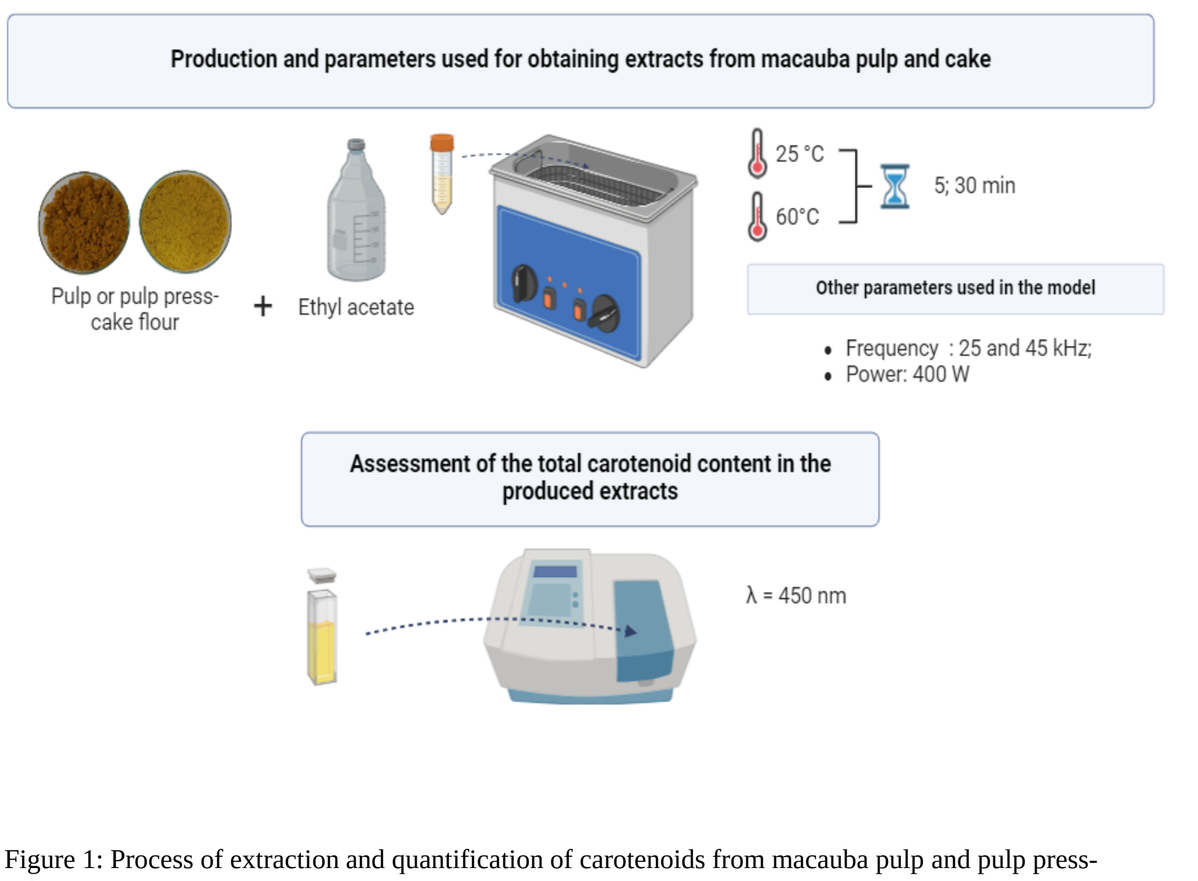

Figure 1: Process of extraction and quantification of carotenoids from macauba pulp and pulp press-cake.

The non-exhaustive extraction of total carotenoids from the raw materials (MP and PPC) was carried out using ultrasound, using ethyl acetate as a solvent. The time, temperature, frequency and power parameters are described in Figure 1.

RESULTS & DISCUSSION

Table 1 presents the optimization model for carotenoid extraction from MP using ultrasound, with an R^2 of 91.68%. Temperature was significant ($p<0.05$), and frequency was marginally significant ($p=0.055$). Increasing temperature to 60°C reduces oil viscosity, aiding compound transfer to the solvent, while ultrasound-induced cavitation improves carotenoid diffusion by disrupting cell walls.

Table 1 - Coefficients of variables and p-values in the multivariate analysis of variance for total carotenoids in macauba pulp using ultrasound.

Variables	Coefficient	p-value
Temperature (X_1)	11,91	0,005**
Frequency (X_3)	5,58	0,055

** p-values < 0,05 indicate statistical significance.

Table 2 presents the optimization model for PPC, which achieved an R^2 value of 99.65%. Temperature, time, and frequency were significant variables ($p<0.05$). Frequency enhanced carotenoid extraction by promoting particle disruption and energy distribution, leading to a more efficient process.

Table 2 - Coefficients of the variables and p-values in the multifactorial analysis of variance for total carotenoids from macauba pulp press-cake using ultrasound.

Variables	Coefficient	p-value
Temperature (X_1)	8,339	0,000**
Time (X_2)	2,524	0,011**
Frequency (X_3)	3,307	0,002**
Interaction		
X_1* X_3	-1,657	0,013**

** p-value < 0.05 indicates statistical significance.

CONCLUSION

Macauba is a promising source of carotenoids for the industry. The use of GRAS solvents and non-conventional technology, such as ultrasound, can enable the sustainable extraction of these compounds, which have potential uses as antioxidants and natural colorants in food.

FUTURE WORK / REFERENCES

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