



EFFECT OF PHOSPHORUS AND CAROTENOIDS REMOVAL FROM MACAUBA OIL (*Acrocomia aculeata*) ONTO ACID ACTIVATED BLEACHING EARTH

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Abstract

The vegetable oil refining process is indispensable for the removal of undesired compounds, such as free fatty acids, metals, degradation compounds and pigments. The bleaching process is an essential step of it, being mainly responsible for the phosphorus and carotenoids removal. Thus, the main goal of this study is to evaluate the acid activated earth concentration and temperature during the bleaching process. The experiments were performed at three temperatures (90, 105, 110 °C) using a concentration bleaching earth varying from 0.2-2.0% wt%.

Key words: Macauba, bleaching, activated clay.

Introduction

Macauba (*Acrocomia aculeata*) is an American palm (Figure 1A) from the tropical zones which the fruit (Figure 1B) presents high oil productivity¹. Its refining comprises the bleaching step, which mainly consists in the removal of phospholipids and pigments such as carotenoids.



Figure 1. Macauba palm (A) and its fruit (B)

- Goal: adsorption of carotenoids and phosphorus from crude macauba oil onto acid activated bleaching earth under high temperature and low pressure, monitoring tocopherols content.

Methods

Bleaching Method:

- ❖ Oil heating (70°C)
- ❖ Citric acid (0.3%) and water (0.2%) addition
- ❖ Agitation – Ultra Turrax (16000rpm for 1 minute)
- ❖ Acid bleaching earth (1800 SUPREME FF) (Figure 2A)
- ❖ Rotary Evaporator (90°C, 105°C and 110°C for 30 minutes) (Figure 2B); Filtration (Figure 2C)
- ❖ Carotenoids (Spectrophotometer), Tocols (HPLC) and phosphorus (Induced coupled plasma) content.



Figure 2. Oil after earth addition (A), rotary evaporator (B) and filtered oil (C)

Results and Discussion

Carotenoids and Phosphorus content

According to Figure 3 both compounds were reduced.

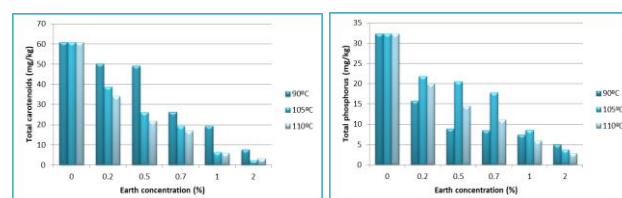


Figure 3. Carotenoids (A) and Phosphorus (B) removal
➤ **Most efficient bleaching earth concentrations**

Table 1. Carotenoids and phosphorus content with 2% (m/m) activated bleaching earth.

| Temperature (°C) | Carotenoids removal (%) | Phosphorus removal (%) |
|------------------|-------------------------|------------------------|
| 90 | 87.3 | 84.5 |
| 105 | 96.3 | 88.4 |
| 110 | 94.7 | 91.1 |

Table 2. Carotenoids and phosphorus content with 1% (m/m) activated earth.

| Temperature (°C) | Carotenoids removal (%) | Phosphorus removal (%) |
|------------------|-------------------------|------------------------|
| 90 | 68.4 | 77.0 |
| 105 | 89.6 | 73.3 |
| 110 | 90.4 | 81.5 |

Tocols content

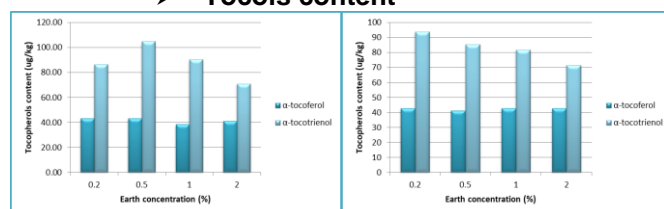


Figure 4. Tocopherols content: (A) 105 °C and (B) 110 °C

Conclusions

The higher removal of total carotenoids and phosphorus was achieved with 2% of activated earth and 110°C temperature. However, a meaningful removal was obtained with half the earth concentration (1%), which represents lower residue generation and process costs. In addition, a higher content of tocols was obtained.

Acknowledgement

