

## THERMAL TREATMENTS AFFECT COLOR, WATER ACTIVITY, AND FATTY ACID PROFILE OF CACHICHÍN SEED (*Oecopetalum mexicanum*)

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### INTRODUCTION & AIM

Cachichín (*Oecopetalum mexicanum*) is a tree that grows naturally in the ecotone between low deciduous forest and high semi-evergreen forest in the Sierra de Misantla, Veracruz, Mexico. The fruit produces an oval nut-like seed, with a thin outer layer and a smooth texture. The region's inhabitants enjoy this food either as raw seed, boiled, and toasted, considering it a traditional and nutritious snack [1]. However, its nutraceutical value remains largely unknown, while the effects of processing methods it undergoes before



consumption has not yet been explored. Further research into the bioactive compounds and their stability during processing could enhance the potential of cachichín as a functional ingredient in modern food products. This study aimed to assess changes in color, water activity, and fatty acid profile of cachichín seeds subjected to different thermal treatments: raw (T1); boiling (T2); commercial toasting (T3), both conducted under empirical conditions by local vendors in the region; and controlled toasting (T4), performed under laboratory conditions at 134 °C for 25 minutes.



Figure 2. Cachichín seed

### METHOD

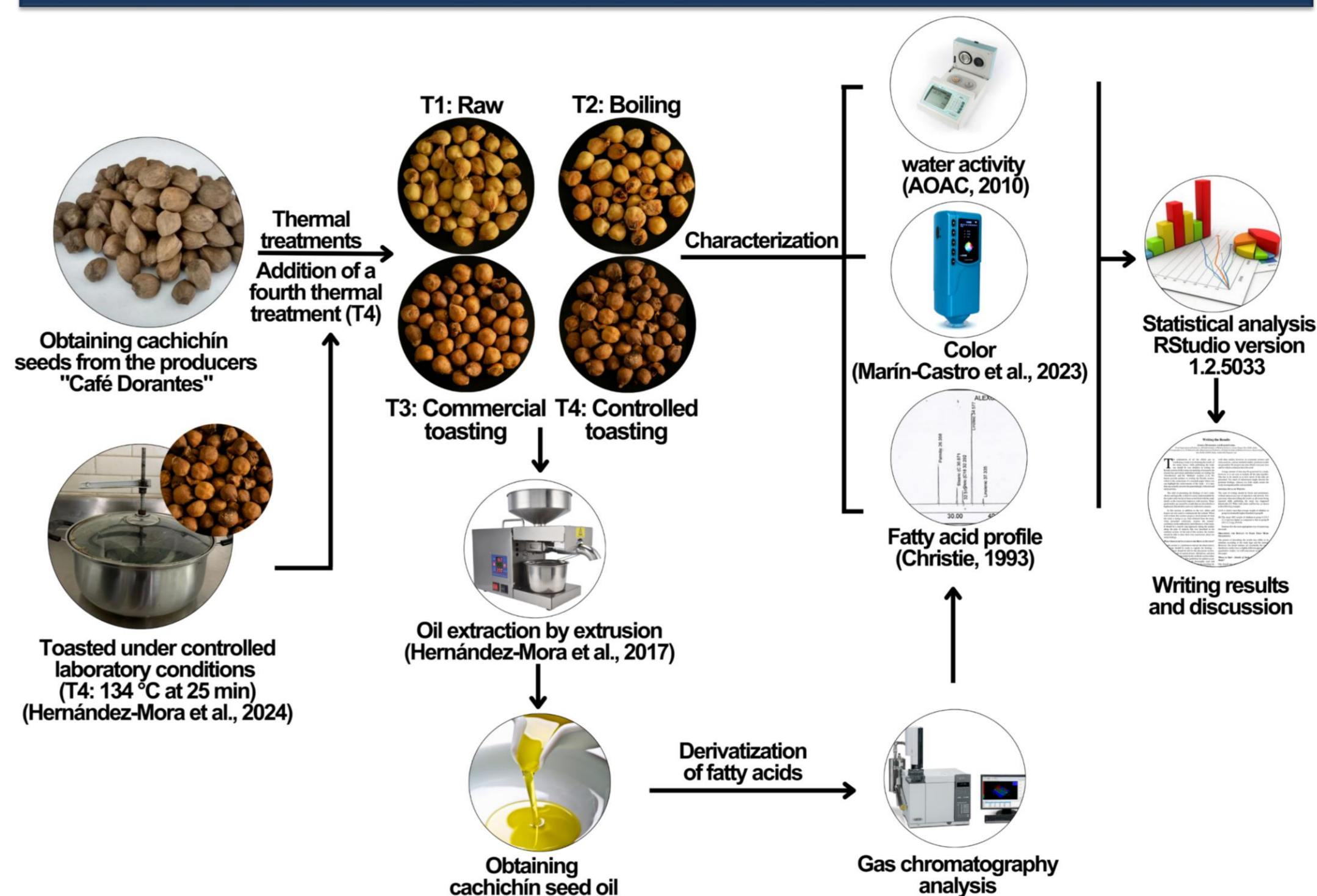


Figure 3. Illustrative methodology used in the present study

### RESULTS & DISCUSSION

The results demonstrated that thermal treatments, compared to raw seeds (T1), significantly affected the water activity and color parameters of the cachichín seed. A significant difference in water activity was observed between treatments T4 and T2, suggesting that the processing method of cachichín seed directly influences moisture retention and free water release. Color is a key sensory attribute that can influence consumer acceptability. In this study, the thermal treatment significantly affected the  $L^*$  (lightness),  $a^*$  (red-green axis), chroma ( $C^*$ ), and  $H^*$  angle (hue) color coordinates. It was observed that T4 resulted in a significant decrease in  $L^*$  compared to T1, while T2 and T3 showed a substantial increase in the  $a^*$  color index. This indicates a darkening of the product, a well-documented phenomenon in the literature due to the Maillard reaction and sugar caramelization, which enhances brown tones due to the formation of melanoidins [2].

Table 1. Color characterization (CIEL  $a^*b^*$ ) and water activity ( $a_w$ ) of cachichín seed (*Oecopetalum mexicanum* Greenm. & C.H. Thomps.) in raw state and under applied thermal treatments.

Variable	Treatments			
	T1	T2	T3	T4
$a_w$	0.54 ± 0.00 ab	0.72 ± 0.00 a	0.44 ± 0.01 ab	0.40 ± 0.00 b
$L^*$	64.62 ± 0.11 a	55.36 ± 0.10 ab	55.04 ± 0.16 ab	47.22 ± 0.25 b
$a^*$	5.06 ± 0.08 b	11.53 ± 0.12 a	11.14 ± 0.09 a	10.38 ± 0.01 ab
$b^*$	20.28 ± 0.04 a	21.49 ± 0.02 a	21.65 ± 0.81 a	21.09 ± 0.07 a
$C^*$	20.91 ± 0.05 c	24.39 ± 0.07 ab	24.95 ± 0.18 a	23.50 ± 0.06 bc
$H^*$	75.99 ± 0.20 a	61.78 ± 0.23 b	63.47 ± 0.39 ab	63.79 ± 0.10 ab
$\Delta E$	-	11.24 ± 0.18 a	11.26 ± 0.28 a	18.17 ± 0.35 a

Note: T1:Raw; T2: Boiled; T3: Commercial toast; T4: Controlled toast. Means ± SE with different letters in each row indicate significant statistical differences among treatments (Dunn's Test,  $p \leq 0.05$ )

Lipid analysis revealed the presence of oleic acid( $\omega$ -9), linoleic acid( $\omega$ -6), and linolenic acid( $\omega$ -3), with significant differences observed mainly between T1 and T3; treatments T2 and T4 showed intermediate values. Notably, T4 resulted in significantly different water activity and color parameters compared to T2. Additionally, the raw seed retained a higher fatty acids content, while commercial toasting led to a greater loss of these compounds. This phenomenon is directly related to the heat-induced mechanism of lipid oxidation and decomposition, which is one of the main factors affecting the stability and composition of fatty acids in foods subjected to thermal processing; these processes form lipid oxidation products (LOP) [3].

The impact of heat on the oxidation and saturation of unsaturated fatty acids is a critical factor to consider when determining the optimal cooking method, as it affects both the nutritional quality and the stability of the product. These findings not only contribute valuable scientific knowledge about the behavior of cachichín seed under thermal treatments but also provide a basis for improving the processing of traditional food products in terms of shelf life, texture, and bioactive properties.

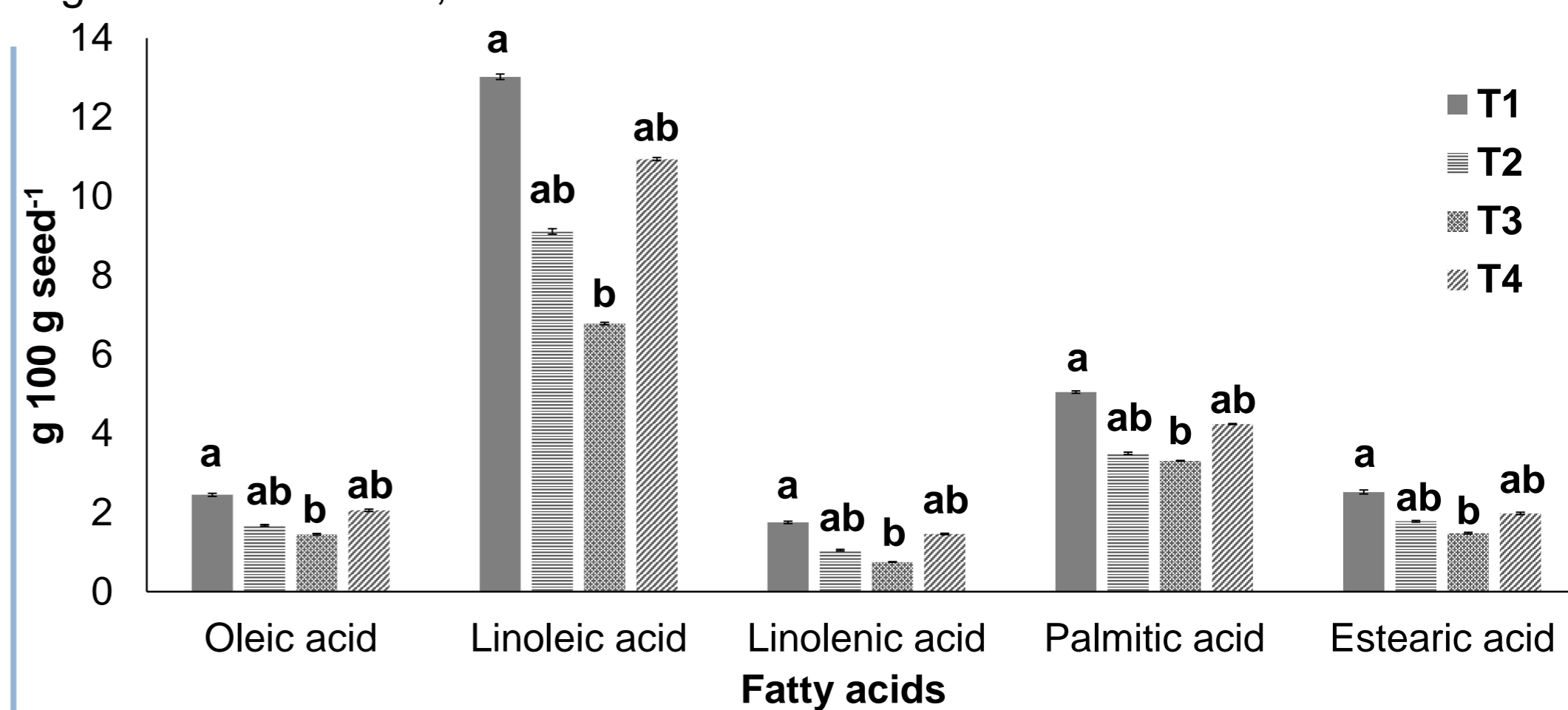


Figure 4. Fatty acid profile of cachichín seed (*Oecopetalum mexicanum*) in its raw state and under applied thermal treatments.

Note: T1:Raw; T2: Boiled; T3: Commercial toast; T4: Controlled toast.

### CONCLUSION / FUTURE WORK

It is concluded that thermal treatments significantly affect the quality of cachichín seed, particularly in terms of fatty acid retention, water activity, and color. These factors are important for selecting the appropriate processing method, as they influence the seed's sensory characteristics, health benefits, and shelf life. Future work should explore optimized processing conditions that maximize nutrient preservation and bioactive properties, providing guidelines for the industrial application of cachichín seeds in nutraceutical and traditional food products.

### REFERENCES

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