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Formulation and Physicochemical Evaluation of Oleogels Based on Toasted Sesame Oil and Organic Candelilla Wax

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INTRODUCTION

The global health issues related to the high consumption of trans fats and saturated fatty acids have led to the establishment of legislative standards worldwide aimed at improving the nutritional properties of food. Oleogelation is a strategy to mitigate these effects, as it often exhibits similar behavior to commonly used fats. In this context, candelilla wax is a substance with potential for use in developing functional foods due to its gelling properties. The objective of this research was to formulate an oleogel based on toasted sesame oil and candelilla wax and compare its physicochemical properties with those of vegetable-based lard.

MATERIALS AND METHODS

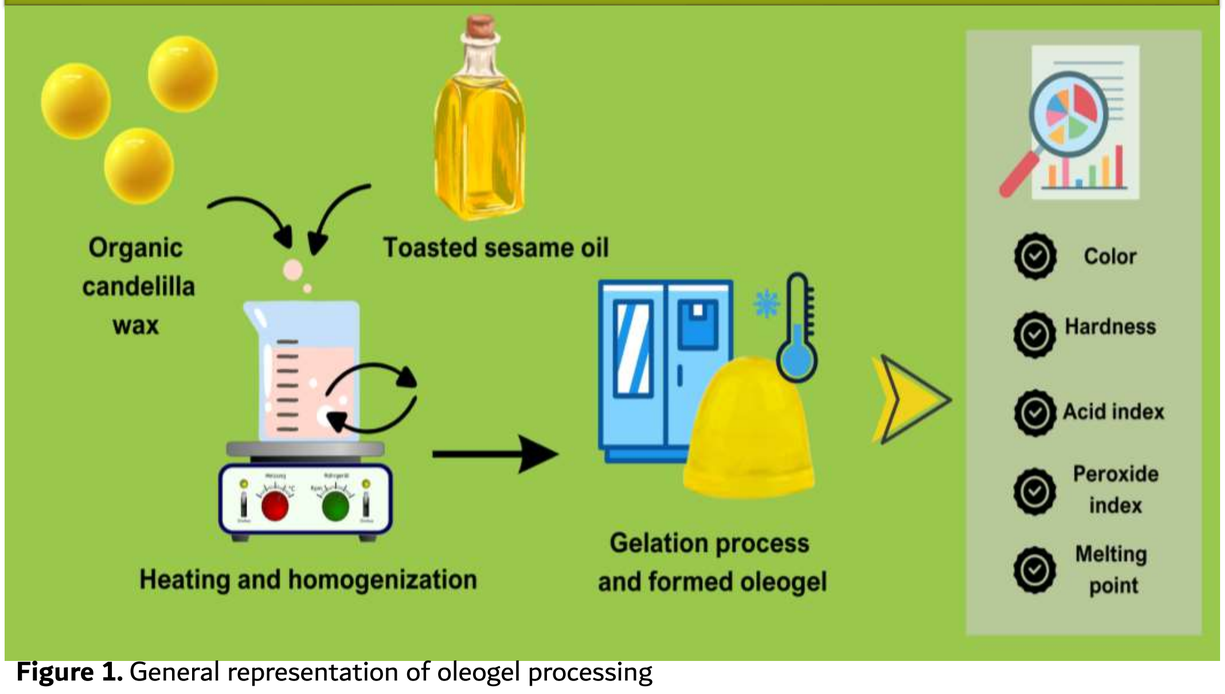

Figure 1. General representation of oleogel processing

Color is an important parameter for determining the quality and acceptability of the final product (Álvarez-Ramírez et al. 2020). In this sense, it can be observed that all samples show a tendency towards higher L values; however, in vegetable fat, this value is higher due to its characteristic white color. As for the a* and b* coordinates, all the oleogel samples show a tendency towards reddish and yellowish hues, respectively, due to the presence of wax, as well as other components present in the oil in smaller proportions, such as lutein, zeaxanthin (yellow), carotenoids (red), and phospholipids (dark) (Zhao et al. 2020)

RESULTS & DISCUSSION

Table 1 .Physicochemical properties of oleogels made from toasted sesame oil and vegetable lard

Parameter		Vegetable lard	Toasted sesame oleogel		
			3%	6%	9%
Color	L*	78.5866 (±1.62)[a]	31.5266 (±1.68)[b]	34.6400 (±0.94)[b]	34.1166 (±1.70)[b]
	a*	-2.8733 (±0.52)[c]	18.0566 (±0.62)[a]	7.6766 (±1.14)[b]	5.0133 (±1.53)[b]
	b*	9.0266 (±0.24)[d]	18.0566(±3.52)[c]	32.8566 (±4.61)[a]	25.4233 (±1.15)[b]
Hardness (N)		37.3961 (±0.05)[a]	0.00 (±0.00)[d]	1.1020(±0.27)[c]	3.9149 (±0.821)[b]
Peroxide index ($meqO_2/Kg$)		0.000 (±0.00)[d]	0.8333 (±0.28)[c]	1.3333 (±0.57)[b]	3.7333 (±1.25)[a]
Acid index (mg NaOH/g)		0.3386 (±0.11)[c]	0.8333 (±0.28)[a]	1.316 (±0.21)[b]	1.363 (±0.08)[b]
Melting point (°C)		46.6333 (±2.02)[b]	34.5333 (±1.11)[c]	46.400 (±2.45)[b]	52.0666 (±1.72)[a]

Regarding hardness, it is shown that in the case of oleogels, this parameter increases as the percentage of wax increases, which is consistent with the findings of Hwang et al. (2016), who indicated that the greater the amount of wax in an oleogel, the higher its hardness will be. However, the hardness levels of the oleogels are significantly lower compared to vegetable lard.

The peroxide index shows an increase in the degree of oxidation as the percentage of wax increases; however, they are within the ranges established by the CODEX STAN 210-1999 standard, whose maximum range for virgin oils is 15 meq O2/kg.

Similarly, the acidity index, which indicates the amount of free fatty acids, shows an increase as the percentage of wax increases, which could be due to the presence of free fatty acids inherent to candelilla wax (Núñez-García et al. 2022); however, they are within the limits established by the standard, whose limit is (10.00 mg KOH/g) for virgin oils.

Regarding the melting point of the oleogels, this property is mainly affected by the composition of the wax. Since candelilla wax contains low-melting n-alkanes (C29 to C33) and other low-molecular-weight compounds, the melting point shows a reduction compared to vegetable fat (Hwang et al. 2016).

CONCLUSION

The oleogel formulated with 3% candelilla wax exhibited the best physicochemical properties and could potentially replace commonly used fats with high saturated and trans fat content in the formulation of traditional Mexican foods.

REFERENCES

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