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Green solvent extraction of pitaya (*Stenocereus spp.*) seed oil

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CONAHCYT

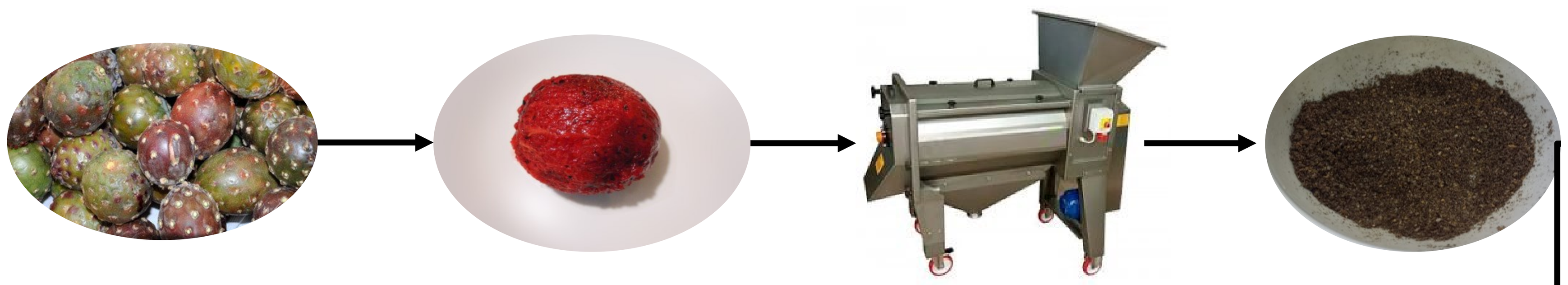
INTRODUCTION & AIM

Pitaya fruit (*Stenocereus spp.*) is recognized for its nutritional benefits and antioxidant profile. This fruit is usually consumed as fresh pulp. The **seeds** and peel are **agroindustrial waste** and comprise between 22 and 29% of the fruit mass. The oil derived from pitaya seeds is of great interest for various industrial applications. This study aims to evaluate the impact of different green solvents on the efficiency of pitaya seed oil extraction, thereby enhancing the valorization of this agroindustrial waste. The green solvents evaluated included ethanol and supercritical CO_2 (SC CO_2), with hexane used as a reference. Extraction methods involved the Soxhlet technique using ethanol and hexane, while SC CO_2 extraction was conducted under two conditions: 180 bar at 50 °C (C1) and 250 bar at 35 °C (C2).

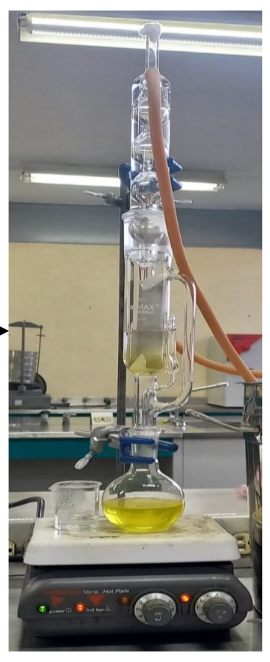
METHOD

Pitaya fruits at physiological maturity were harvested from the Mixteca Poblana region in Mexico.

Seeds recovering process



Seeds were dehydrated at 50 °C reaching a moisture content < 3% and crushed for extraction.



Soxhlet extraction: Ethanol and hexane at boiling temperature for 8 hours.

SFE: Helix equipment,180 bar at 50 °C and 250 bar at 35 °C, flow rate of 50 g/min and 450 min.

RESULTS & DISCUSSION

The **highest yield** was obtained with hexane (Table 1), consistent with the findings of Neder-Suárez et al. [1] and Ortega-Nieblas et al. [2], who reported yields of 26.5 ± 0.7% and 28.4 ± 0.1%, respectively. On the other hand, a major oil extraction was obtained using CO_2 at **250 bar at 35 °C (C2)** than 180 bar at 50 °C (C1) conditions. The oil extraction yield increases with higher pressure and lower temperature, as these conditions enhance oil solubility [3]. For pitahaya (*Selenicereus undatus*) seed oil, Qiu-ling [4], report the optimal extraction parameters are a pressure of 25 MPa, a temperature of 40°C.

Table 1. Oil yield from pitaya seeds using different solvents.

Solvent	Yield
Hexane	24.7 ± 0.4 %
Ethanol	6.8 ± 0.8 %
$CO_2$180 bar at 50 °C	5.0 ± 0.0 %
$CO_2$250 bar at 35 °C	15.3 ± 0.0 %

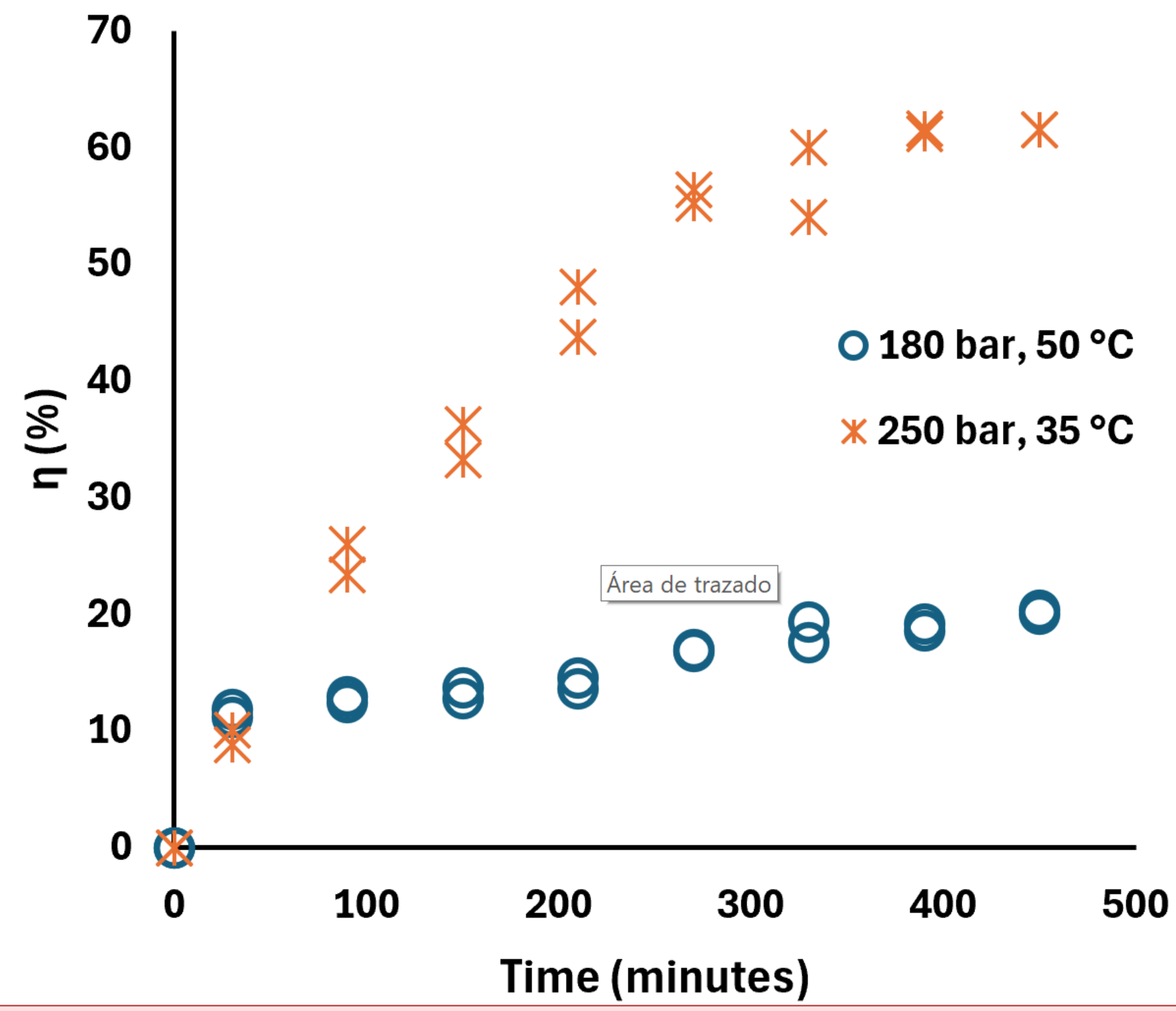


Figure 1. Extraction kinetics of oil from pitaya seeds using supercritical CO_2.

CONCLUSION

These findings underscore the varying efficiencies of each solvent demonstrating that supercritical fluid extraction is an alternative for pitaya seed oil extraction, promoting the utilization of agricultural by-products, aligning with current trends toward environmentally friendly practices supporting the circular bioeconomy.

FUTURE WORK / REFERENCES

The next stage involves optimizing the extraction conditions for oil using supercritical CO_2, followed by the characterization of the extracted oil.

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