



Supercritical fluid extraction and pulsed electric field assisted extraction of *Zizyphus lotus* fruits, leaves and roots

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INTRODUCTION

The shortcoming of using conventional methods have promoted innovative methodologies such as supercritical fluid technology and pulsed electric field-assisted extraction has been proposed as sustainable methodologies to isolate nutraceuticals and pharmaceuticals from natural matrices such as herbs, spices, aromatic and medicinal plants. In recent years, the extracts of plant parts of different genus such as *Zizyphus*, have been investigated for their several biological properties and therapeutic activities including those as an antioxidant, antitumoral, hepatoprotective and antimicrobial. The study aimed to obtain extracts from fruits, leaves and roots of *Zizyphus lotus* by Supercritical Fluid Extraction (SFE) and Pulsed Electric Field (PEF) assisted extraction.

METHODOLOGY

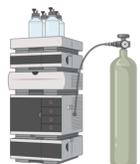
Raw material



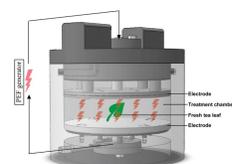
Fruits, leaves and roots of *Zizyphus lotus*

Green-extraction methodologies

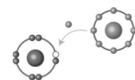
Supercritical fluid extraction



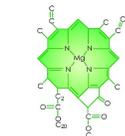
Pulsed electric field



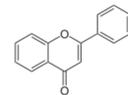
Analysis



Antioxidant capacity (ORAC and TEAC)



Chlorophyll



Total Phenolic content (GAE)



Carotenoids

RESULTS

| Methodology | Plant part | Oxygen Radical Absorbance Capacity (ORAC; $\mu\text{M TE/g DW}$) | Trolox Equivalent Antioxidant Capacity (TEAC; $\mu\text{M TE/g DW}$) | Total Phenolic compounds contents (TPC) (mg/g DW) |
|-------------|------------|---|---|---|
| PEF | Fruits | 166.949 \pm 12 | 82.26 \pm 0.5 | 14.791 \pm 0.1 |
| | Leaves | 371.939 \pm 17 | 187.33 \pm 3.7 | 31.117 \pm 1.8 |
| | Roots | 383.63 \pm 35 | 99.59 \pm 2.4 | 28.773 \pm 1.7 |
| SFE | Fruits | 701.021 \pm 44 | 0.50 \pm 0.161 | 0.581 \pm 0.02 |
| | Leaves | 589.504 \pm 29 | 0.95 \pm 0.1 | 1.184 \pm 0.2 |
| | Roots | 970.262 \pm 70 | 0.77 \pm 0.07 | 5.716 \pm 0.8 |

| Methodology | Plant part | Chlorophyll a Contents (mg/g DW) | Chlorophyll b Contents (mg/g DW) | Carotenoids contents (mg/g DW) |
|-------------|------------|----------------------------------|----------------------------------|--------------------------------|
| PEF | Fruits | 115.380 \pm 0.6 | 250.415 \pm 1 | 127.947 \pm 0.5 |
| | Leaves | 203.566 \pm 12 | 267.877 \pm 10 | 61.73 \pm 1 |
| | Roots | 121.12 \pm 16 | 70.963 \pm 9 | 168.878 \pm 1 |
| SFE | Fruits | 0.009 \pm 0.001 | 0.925 \pm 0.1 | 0.907 \pm 0.0001 |
| | Leaves | 1,247 \pm 0.02 | 95.844 \pm 1 | 19.763 \pm 0.02 |
| | Roots | 0.057 \pm 0.001 | 8.437 \pm 0.1 | 4.968 \pm 0.04 |

CONCLUSION

Green-extraction methodologies represent an efficient, economical and safe extraction techniques to recover the bioactive compounds without losing their quality and properties. The extract of plant parts (fruits, leaves and roots) of *Zizyphus lotus* has demonstrated an interesting antioxidant activity by 2 different innovative methodologies.