



## PREPARATION AND CHARACTERIZATION OF NATURAL DEEP EUTECTIC SOLVENTS (NADES): APPLICATION IN THE EXTRACTION OF BIOACTIVE COMPOUNDS FROM AMAZONIAN PLANTS

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COMO CITAR ESSE TRABALHO?

### Resumo

Interest in more sustainable alternatives for extracting bioactive compounds has encouraged the development of natural deep eutectic solvents (NADES) to replace conventional organic solvents. This study aimed to (i) develop and characterize NADES based on choline chloride combined with citric acid (CC-CA), glucose (CC-G), and urea (CC-U), and (ii) obtain bioactive extracts from yellow Uxi bark (YU) and Jambolan leaves (JL) using these solvents. NADES were prepared under heating (60 °C) and stirring (2 h). CC-CA and CC-G were produced at a 1:1 (m/m) ratio with 30% water, while CC-U was prepared at a 1:2 ratio with the same water proportion. Six extracts were obtained by ultrasound-assisted extraction (45 °C, 2 h): Uxi with CC-CA (YU-CA), CC-G (YU-G), and CC-U (YU-U); and Jambolan with CC-CA (JL-CA), CC-G (JL-G), and CC-U (JL-U). The extracts were characterized for total reducing capacity (Folin-Ciocalteu), antioxidant activity (DPPH % reduction), and antimicrobial activity. The pH values ranged from highly acidic (CC-CA, pH 0) to neutral (CC-U, pH 7), reflecting the influence of the hydrogen bond donor. Density varied between 1.152 g cm<sup>-3</sup> (CC-U) and 1.239 g cm<sup>-3</sup> (CC-G). Viscosity was highest for CC-G (18.37 mPa·s) and lowest for CC-U (3.74 mPa·s). CC-CA showed the lowest ENR value (44.6 ± 0.1 kcal mol<sup>-1</sup>), being the most polar, whereas CC-G presented the highest value (49.9 ± 0.1 kcal mol<sup>-1</sup>). YU and JL showed high carbohydrate contents (YU: 81.58 g 100 g<sup>-1</sup>; JL: 77.85 g 100 g<sup>-1</sup>). Multielement analysis in YU and JL revealed trace levels of heavy metals such as cadmium (3 µg g<sup>-1</sup>), chromium (2 µg g<sup>-1</sup>), cobalt (3 µg g<sup>-1</sup>), and lead (21 µg g<sup>-1</sup>). For YU, the highest total reducing capacities were observed in YU-G (4.69 mg GAE mL<sup>-1</sup>) and YU-CA (4.23 mg GAE mL<sup>-1</sup>), whereas JL-CA exhibited the highest value (5.57 mg GAE mL<sup>-1</sup>). Antioxidant activity, assessed by the DPPH assay, was strongest in YU-CA (95.15%) and JL-CA (89.82%). Antimicrobial evaluation showed larger inhibition zones for CC-CA-based extracts. YU-CA inhibited *Staphylococcus aureus* (30 mm), *Pseudomonas aeruginosa* (34.3 mm), and *Salmonella* sp. (15.2 mm). Similarly, JL-CA inhibited the same microorganisms, with zones greater than 20 mm. The results confirm that NADES, particularly CC-CA, represent an efficient strategy for extracting bioactive compounds from Uxi and Jambolan. The high antioxidant and antimicrobial potential support the production of natural additives and active packaging materials. This approach reinforces the use of greener technologies in valorizing Amazonian plants.



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### Instituições

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#### Eixo Temático

- Engenharia de Processos e Tecnologias Emergentes (ET)

#### Palavras-chave

NADES

Bioactive compounds

Amazonian plant

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