Reusing food waste: Ascorbic acid extraction from orange peel using ultrasound-assisted extraction and natural deep eutectic solvents.

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Introduction

USE OR REUSE THE WASTE

FOOD INDUSTRY
Introduction

Use or reuse the waste food industry

BIOACTIVE COMPOUNDS

Food Industry

Use or reuse the waste
Introduction

USE OR REUSE THE WASTE FOOD INDUSTRY

BIOACTIVE COMPOUNDS

FOOD INDUSTRY

USE OR REUSE THE WASTE
Introduction

Ascorbic acid

- Enzyme cofactor for biochemical reactions
- Collagen formation
- Maintain the normal function of immune system
- Protect from oxidative stress
- Protective role against cardiovascular diseases

Ascorbic acid is a bioactive compound found in fruits and vegetables, offering various health benefits.
Introduction

Use or Reuse the Waste

Food Industry

Ultrasound-Assisted Extraction

BIOACTIVE COMPOUNDS

Ascorbic acid

Natural Deep Eutectic Solvents

- Eutectic mixtures
- Low melting point
- Physicochemical properties
Materials and Methods

Malic acid:L-Proline
Lactic acid:Glucose
Malic acid:Glucose
Betaine:Malic acid
Choline chloride:Lactic acid
Choline chloride:L-proline:Malic Acid

Molar Ratio → Mixed → 60-80°C → + H₂O → NADES (Transparent liquid)
Materials and Methods

**UAE of ascorbic acid**

- Stablish extraction time: 5, 10, 15 min
- Stablish extraction power: 100, 200, 400W
- Stablish post-treatment stirring time: 0, 20, 30, 45 min
Materials and Methods

Determination of ascorbic acid by HPLC-UV/VIS

2 ml sample

1 ml Acetic acid-HPO₃

UAE: Ultrasound-assisted extraction

MilliQ Water/Formic Acid (95:5)

Acetonitrile/phase A (60:40)

Ascorbic acid calibration curve

mg AA/100ml extract

Establish extraction time: 5, 10, 15 min

Establish extraction power: 100, 200, 400W

Establish post-treatment stirring time: 0, 20, 30, 45 min
## Results and Discussion

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EtOH 50% (v/v) as a control
## Results and Discussion

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L-proline: malic acid

- 7.44 mg/100 ml

Malic acid: glucose

- 11.76 mg/100 ml
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- **EtOH 50% (v/v) as a control**

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**Calibration curve**

- Calibration curve: $R = 0.999$

**Malic acid: glucose**

- 11.76 mg/100 ml

**L-proline: malic acid**

- 7.44 mg/100 ml

**ChChl.LA**

- 4.45

**ChChl.LP.MA**

- 4.20

**Bet:MA**

- 5.25

**EtOH**

- 6.45

**LA.Glu**

- 3.82

**LP.MA**

- 7.97

**MA.Glu**

- 13.99

**3,82** 7,97 13,99 4,45 4,20 5,25 6,45

**5 mg/100 ml**
Results and Discussion

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EtOH 50% (v/v) as a control

Calibration curve

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Malic acid: glucose

Calibration curve

Ascobic Acid

1.2750.300

R = 0.999

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LA.Glu

LP.MA

MA.Glu

ChChl.LA

ChChl.LP.MA

Bet:MA

EtOH

Maíc acid: glucose

Malic: glucose

L-proline: malic acid

Bet:ma
Conclusions

• The extraction efficiency of MA:Glu is higher than all of the NADES studied
• Two of the studied NADES extracted more AA than EtOH 50% from orange peel.
• NADES could be a better solvents than EtOH for the extraction of AA from orange peel
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