Department of Preventive Medicine and Public Health, Food Science, Toxicology and Forensic Medicine

Foods 2022
The 3rd International Electronic Conference on Foods: Food, Microbiome, and Health
01–15 OCTOBER 2022 | ONLINE

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

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# Introduction

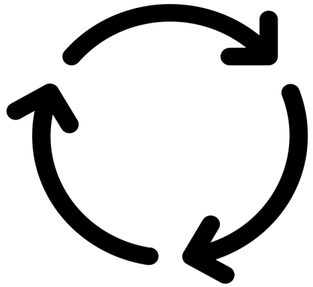
FOOD INDUSTRY

USE OR REUSE THE WASTE

# Introduction

BIOACTIVE COMPOUNDS

FOOD INDUSTRY



USE OR REUSE THE WASTE

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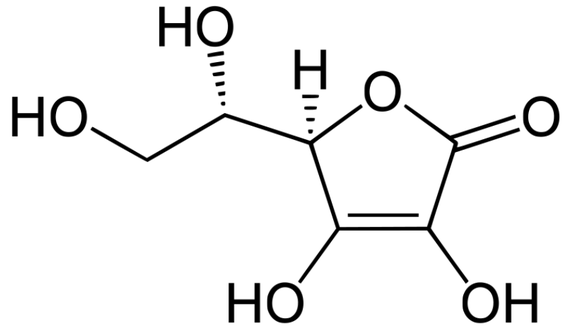
BIOACTIVE COMPOUNDS



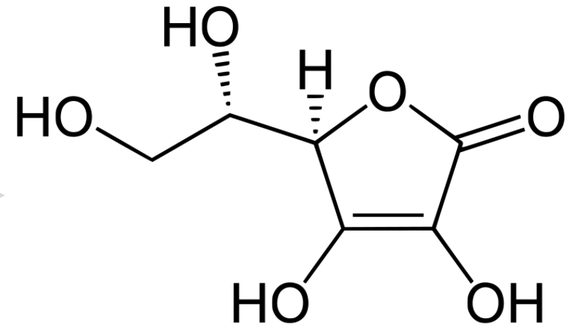

FOOD INDUSTRY

USE OR REUSE THE WASTE

# Introduction

**Enzyme cofactor for biochemical reactions**

**Collagen formation**

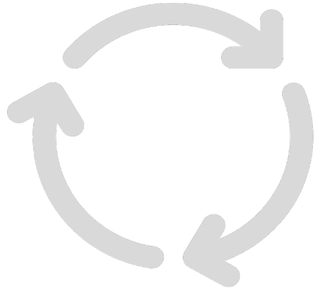



Ascorbic acid

**Maintain the normal function of immune system**

FOOD INDUSTRY

**Protect from oxidative stress**

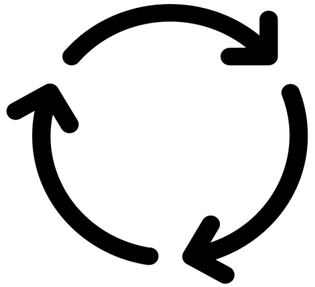


**Protective role against cardiovascular diseases**

USE OR REUSE THE WASTE

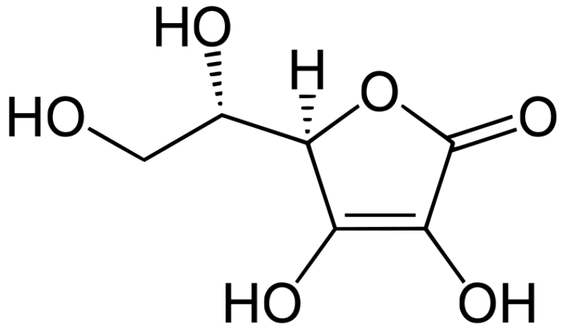
# Introduction

FOOD INDUSTRY



USE OR REUSE THE WASTE

BIOACTIVE COMPOUNDS



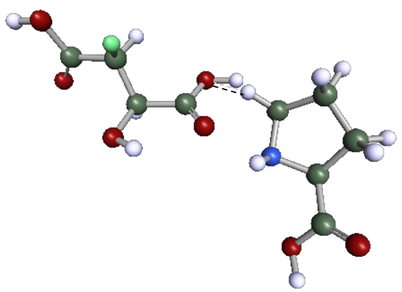

Ascorbic acid

Ultrasound-Assisted Extraction

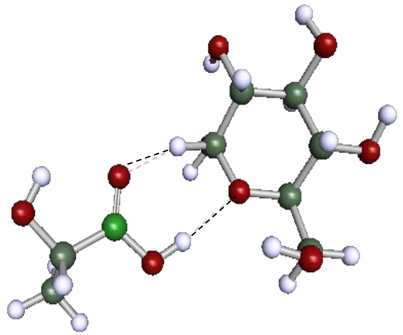
Natural Deep Eutectic Solvents

- Eutectic mixtures
- Low melting point
- Physicochemical properties

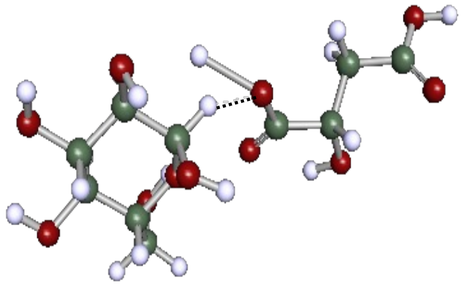
# Materials and Methods



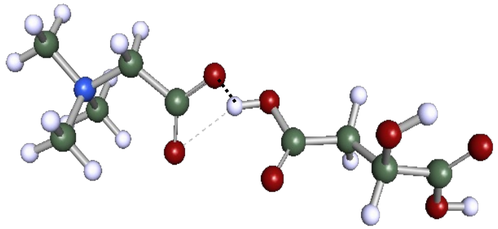
Malic acid:L-Proline



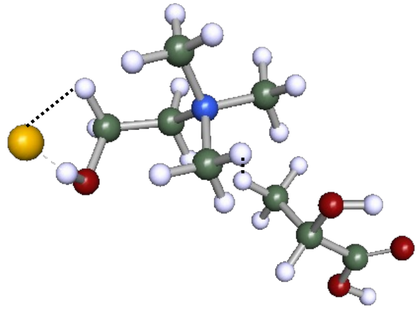
Lactic acid:Glucose



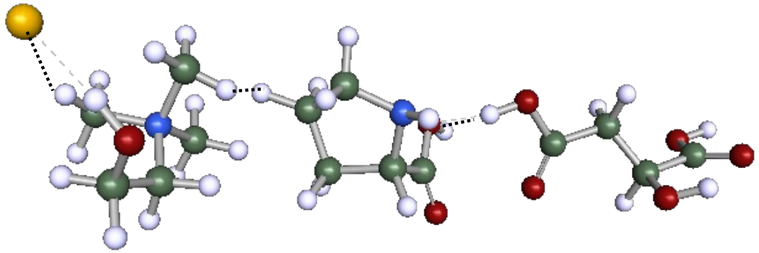
Malic acid:Glucose



Betaine:Malic acid



Choline chloride:Lactic acid



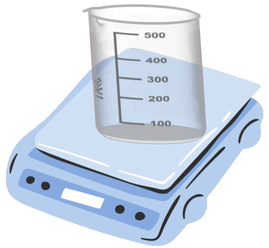
Choline chloride:L-proline:Malic Acid

Molar Ratio


Mixed

60-80ºC

+ $H_2O$




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

UAE: Ultrasound-assisted extraction

# Materials and Methods

UAE of ascorbic acid



Stablish extraction time: 5, 10, 15 min

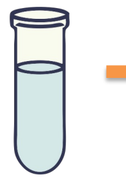
Stablish extraction power: 100, 200, 400W

Stablish post-treatment stirring time: 0, 20, 30, 45 min

**Determination of ascorbic acid by HPLC-UV/VIS**

2 ml sample

1 ml Acetic acid-$HPO_3$

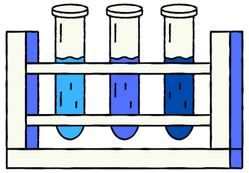




Acetonitrile/phase A (60:40)

MilliQ Water/Formic Acid (95:5)


x 3



Ascorbic acid calibration curve → mg AA/100ml extract

UAE: Ultrasound-assisted extraction

# Results and Discussion

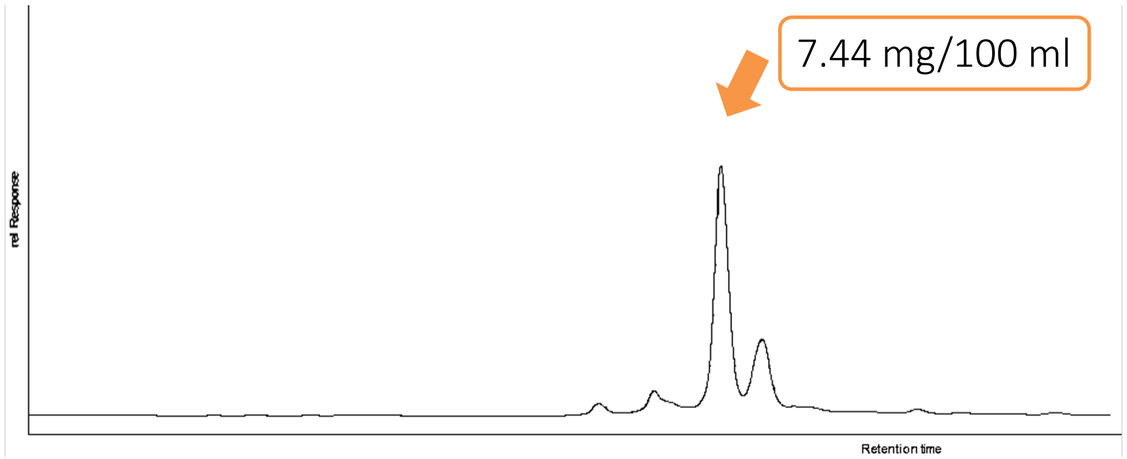
| NADES | % water | Power (W) | Time (min) | Stirring (min) |
|---|---|---|---|---|
| NADES | 25 | 100 | 10 | 40 |

EtOH 50% (v/v) as a control

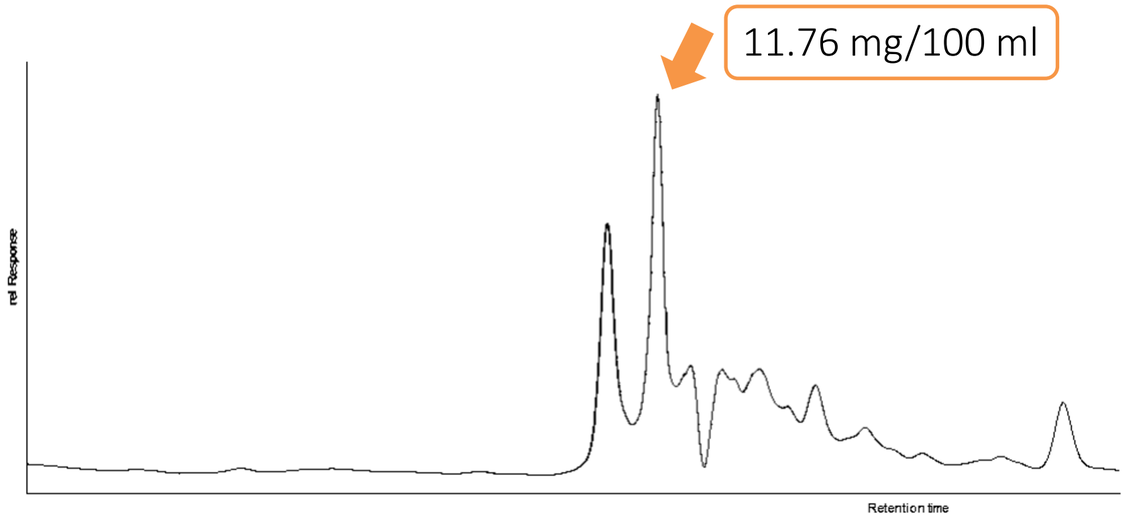
# Results and Discussion

| NADES | % water | Power (W) | Time (min) | Stirring (min) |
|---|---|---|---|---|
| NADES | 25 | 100 | 10 | 40 |

EtOH 50% (v/v) as a control



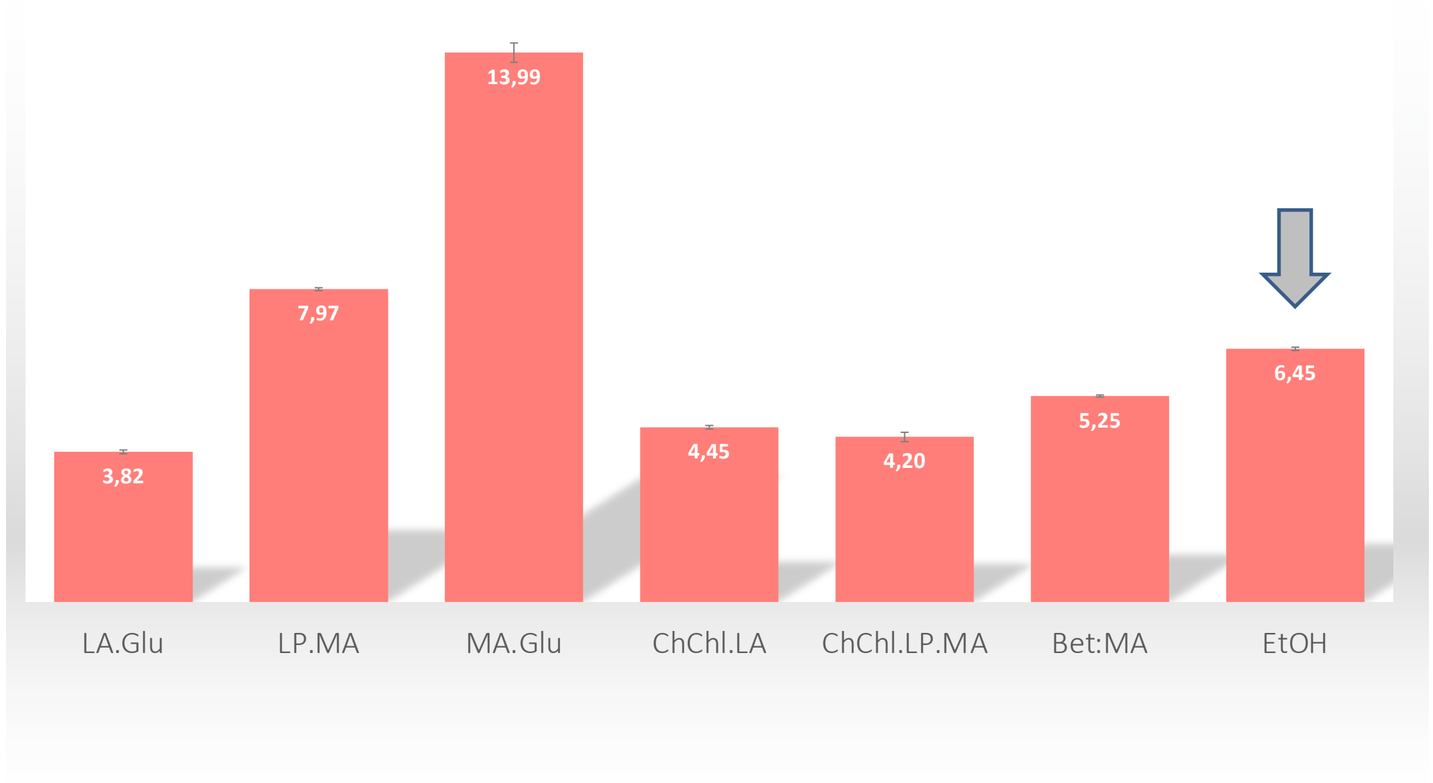

L-proline: malic acid



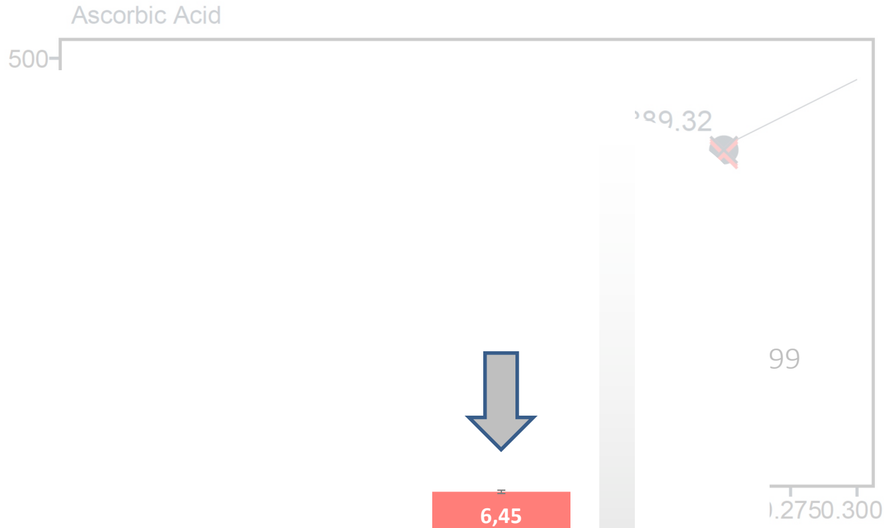

Malic acid: glucose

# Results and Discussion

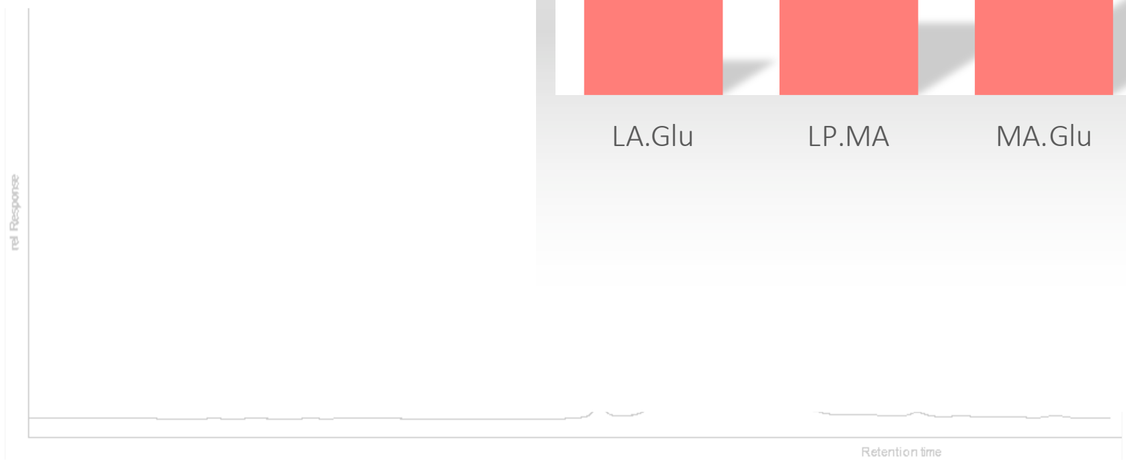
| NADES | % water | Po |
|---|---|---|
| NADES | 25 | |



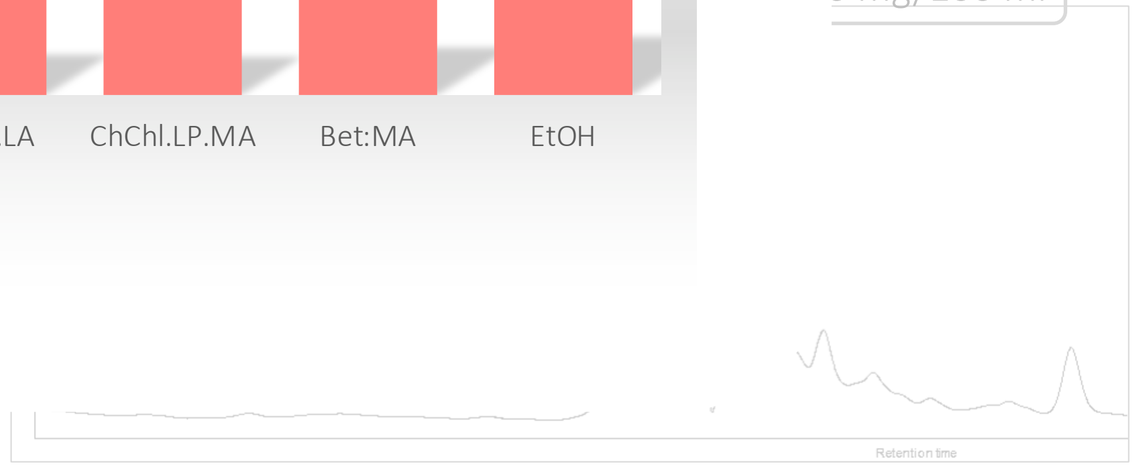

Calibration curve




6 mg/100 ml




L-proline: malic acid

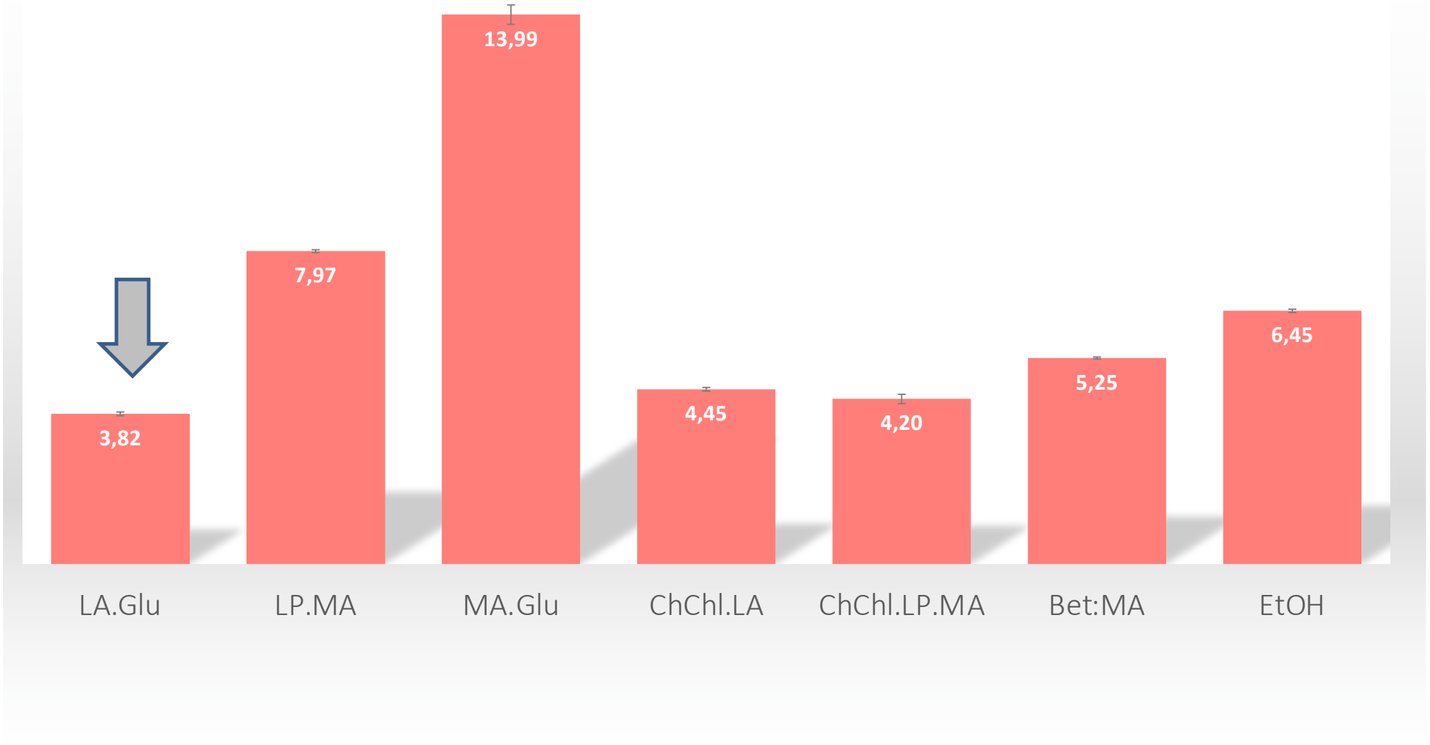



Malic acid: glucose

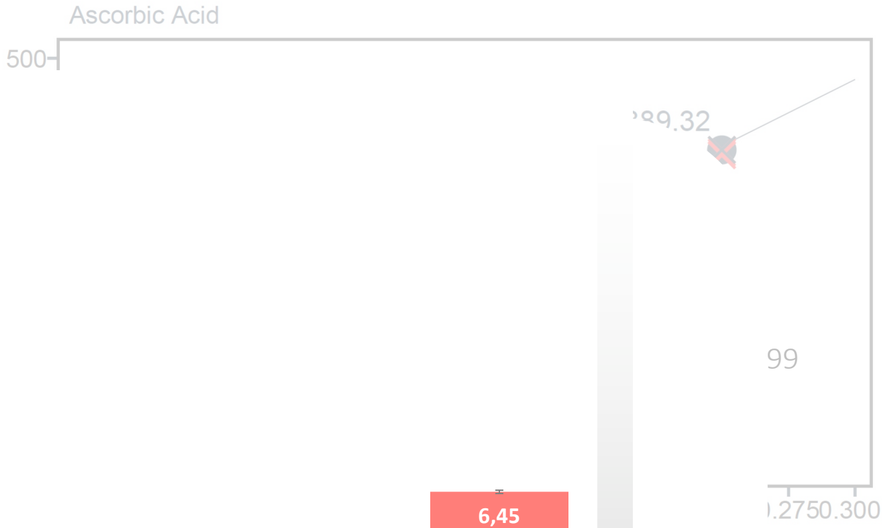
# Results and Discussion

| NADES | % water | Po |
|---|---|---|

| NADES | 25 |
|---|---|




Calibration curve

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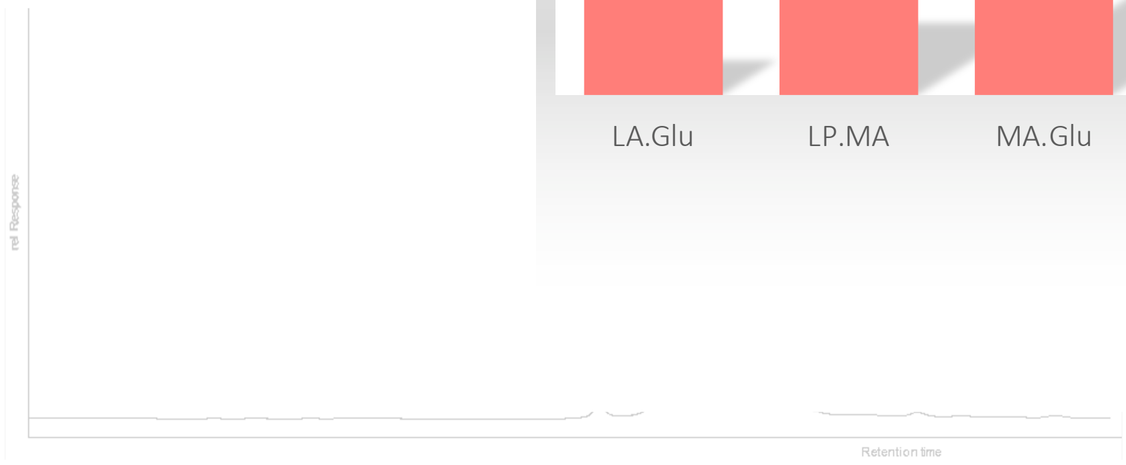
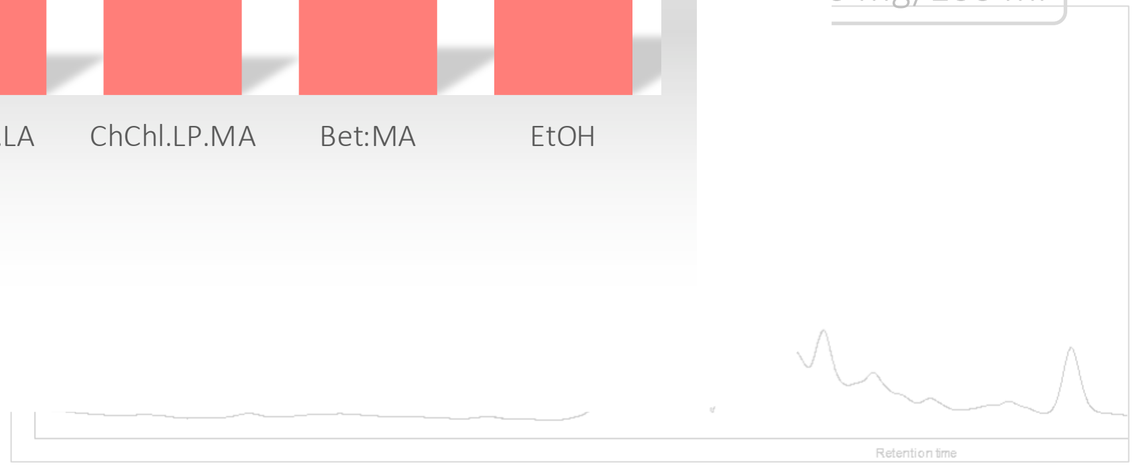



L-proline: malic acid




Malic acid: glucose

# 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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