

AFTERLIFE

WORKSHOP - Advanced Filtration Technologies for the Recovery and Later conversion of relevant Fractions from wastewater

OCTOBER 09, 2020

SUSTAINABLE EXTRACTION OF AMINO ACIDS FROM AGRO-INDUSTRIAL WASTEWATER STREAMS



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AFTERLIFE has received funding from the Bio-Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation program under grant agreement No. 745737 .

➤ Agri-Food Industry Wastes

➤ What

Wastewaters (AFTERLIFE) & other sources/materials
By-products: considered wastes in most cases

➤ Why

Huge amount of material
Important source of high added value compounds
Existing technologies are able to recover these valuables



➤ But...

Lab scale
Marketable products are still rare



➤ Amino Acids

➤ What are they

Important biological building blocks: PROTEINS
Alpha aminoacids; L-isomer
Essential aminoacids: must be supplied by diet

➤ Commercial Applications

Food Industry

- Flavour enhancers
- Sweeteners
- antioxidants

Nutraceutical Industry

- Administration in post-operative treatment
- Feed supplements
- N-acyl derivatives in cosmetics

Chemical Industry

- Fertilizers
- Synthetic polymers
- General building blocks

➤ Raw Material for Free Amino Acid Obtention

➤ Protein-Rich Streams

From Crops

Rendering (animal protein)

Other sources: algae, whey, etc.

➤ AFTERLIFE: Citromill Essential Oil Line Wastewaters



Essential Oils



Pectins



Polyphenols



➤ Raw Material for Free Amino Acid Obtention

➤ Protein-Rich Streams

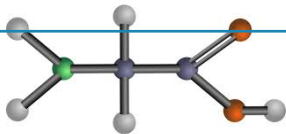
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➤ AFTERLIFE: Citromill Essential Oil Line Wastewaters

Amino Acids



Analysis by HPLC

30% of aminoacids (dry weight)

>50% essential AA



➤ WP2: Protein Hydrolysis and isolation of free AminoAcids

AminoAcid*	AMINOGRAM (% of each AA)	% of AA, dry weight basis
Aspartic Acid	7,7%	2,32%
Glutamic Acid	6,3%	1,89%
Serine	2,6%	0,78%
Glycine	1,2%	0,36%
Histidine	3,4%	1,01%
Arginine	7,4%	2,22%
Threonine	21,1%	6,34%
Alanine	ND	0,00%
Proline	9,2%	2,77%
Tyrosine	2,7%	0,81%
Valine	1,8%	0,53%
Methionine	3,3%	0,98%
Cystine	ND	0,00%
Isoleucine	2,7%	0,82%
Leucine	4,4%	1,32%
Phenylalanine	2,8%	0,85%
Lysine	23,3%	7,00%
Total AA	100%	30,0%
Essential AA	62,8%	18,9%

Chemical Hydrolysis of proteins:

- Analysis: harsh conditions (6N HCl, 110°C@24 h)

100% hydrolysis: all protein converted into free AA (with some exceptions)

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-Alkaline medium:

-Citric Acid

Low Yields

-Phosphoric Acid

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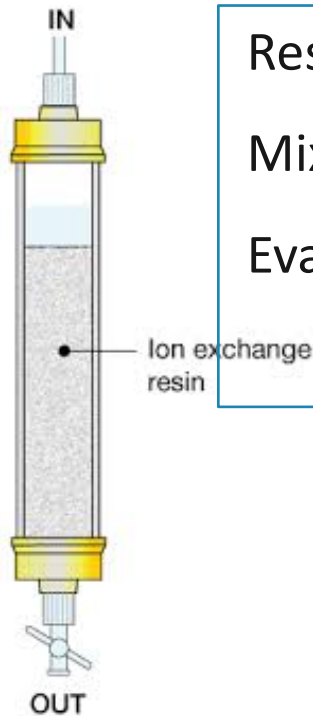
- Citric Acid

- Phosphoric Acid

- Oxalic Acid: ✓

➤ WP2: Protein Hydrolysis and isolation of free AminoAcids

➤ Work-up



Resin purification and concentration

Mixed mode resin: Reverse Phase & Cation Exchange

Evaporation of MetOH elution solvent: AA recovery as solid

➤ Alternative, Sustainable Obtention of Amino Acids

➤ Chemical Extraction

Well-known method

Good and consistent results, with limitations

Scalability

Aminoacids can be degraded by conditions

Standard Equipment and low cost



➤ Alternative, Sustainable Obtention of Amino Acids

➤ Sub-Critical Water Extraction

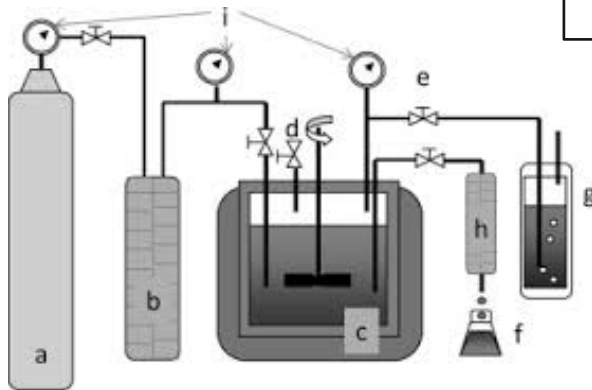
Solvent is just water

Sub.critical water shows interesting properties

More reactive as an acid or base like catalyst

Aminoacids can be degraded by high temp.

Equipment and operational cost is high



➤ Alternative, Sustainable Obtention of Amino Acids

➤ Enzymatic Extraction

Solvent is just water

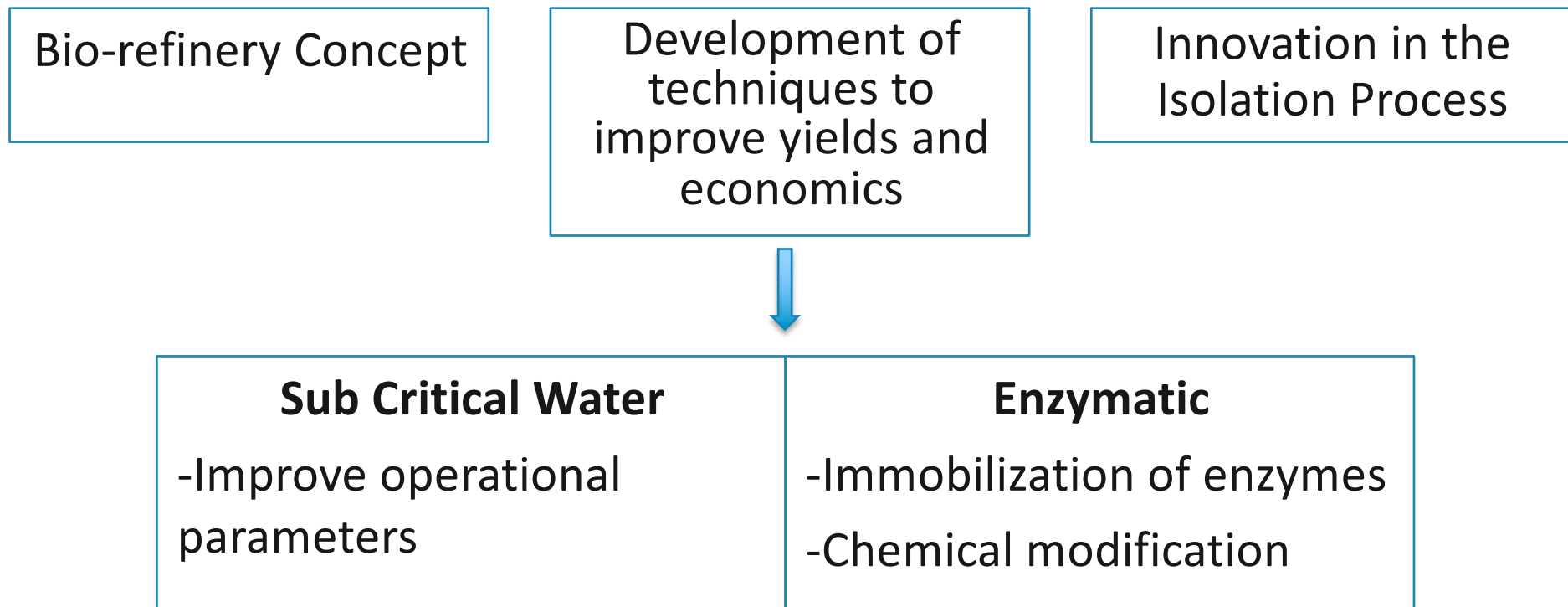
Enzymes are very selective

No degradation of aminoacids

Expensive chemicals

Exhaustive control of medium conditions

➤ PERSPECTIVES



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THANK YOU !!



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