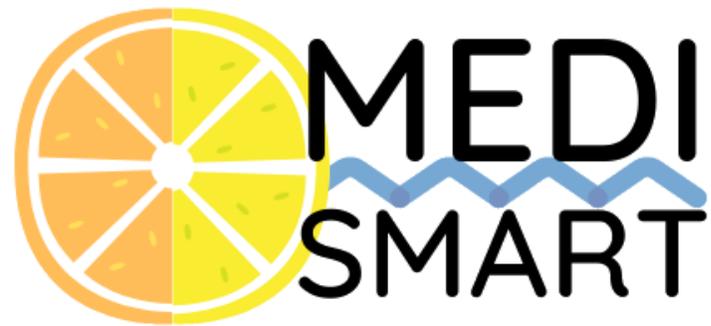




# MEDISMART: from the peels of oranges and lemons, a raw material with nutritional value

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1 SECTOR



6 Partners  
2 companies  
5 countries



New products & technologies  
PhD Thesis  
Training programmes



7 Workpackages

October 2020

Valorising citrus sector, mainly fresh lemon and orange and juice and derived wastes, creating innovative, healthy and sustainable products

October 2023

# TEAM WORK - MEDISMART



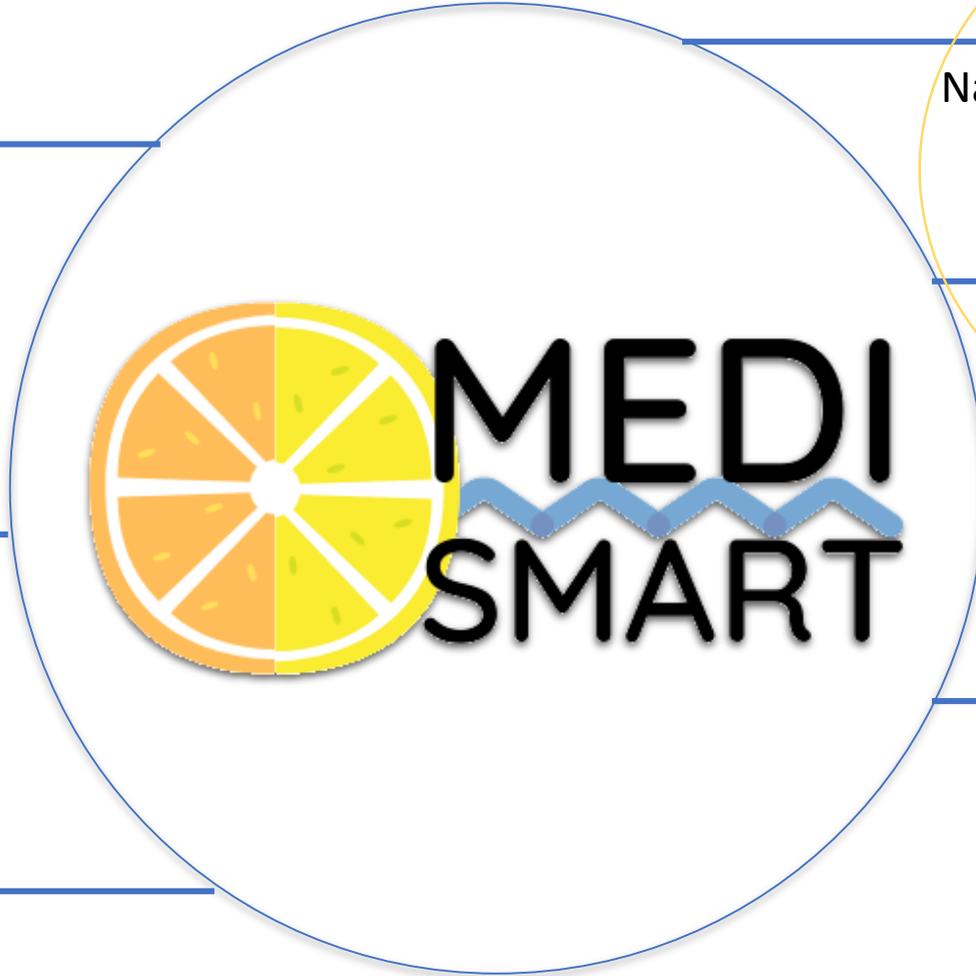
Stazione Sperimentale per l'Industria  
delle Conserve Alimentari



AMC Innova Juice and Drinks



Tarimas Bursa Hayvancilik  
Tarim Sanayi ve Ticaret A.S



National Research Center



Escola Superior de Biotecnologia-  
Universidade Católica Portuguesa

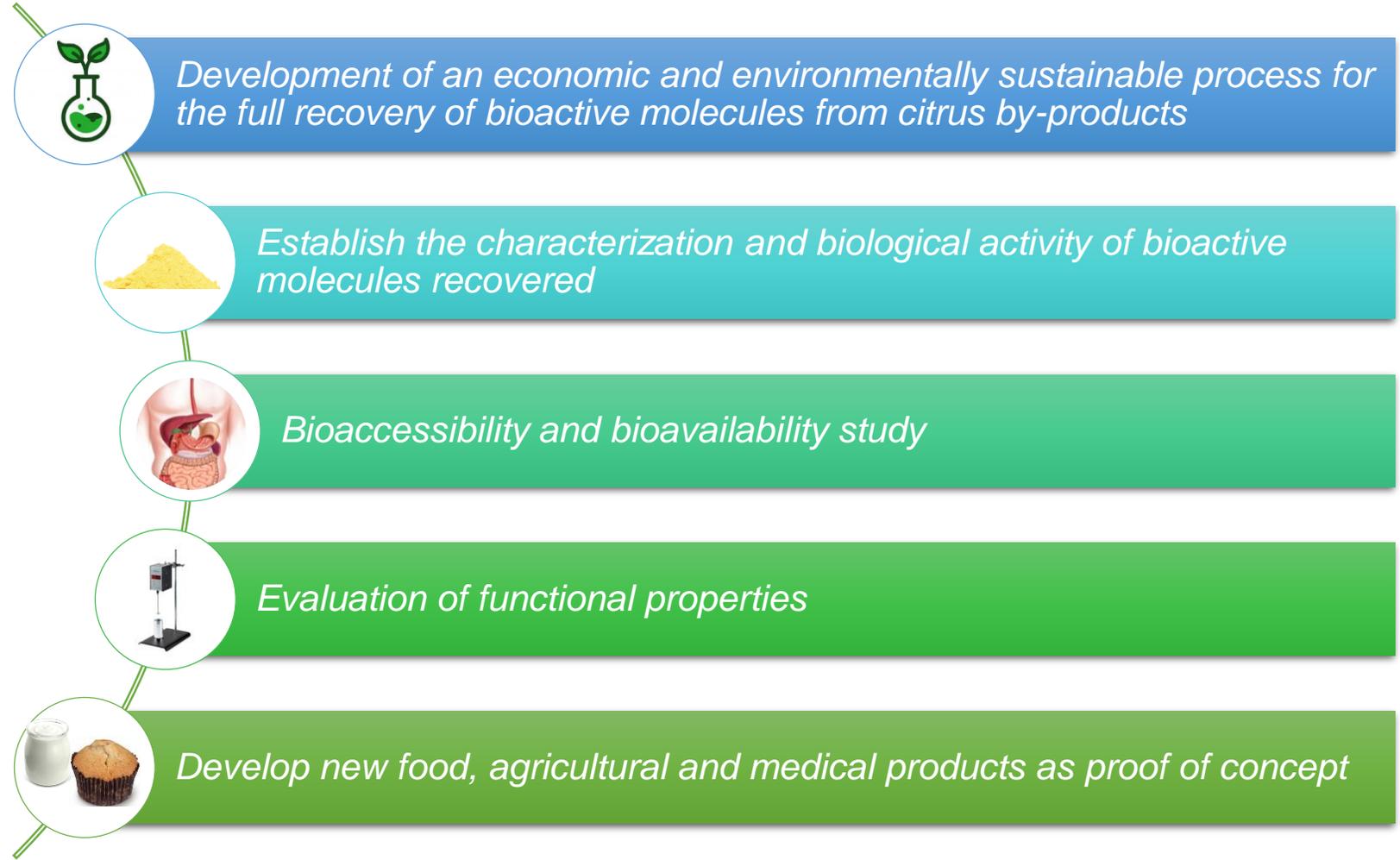


Central Research Institute of Food  
and Feed Control

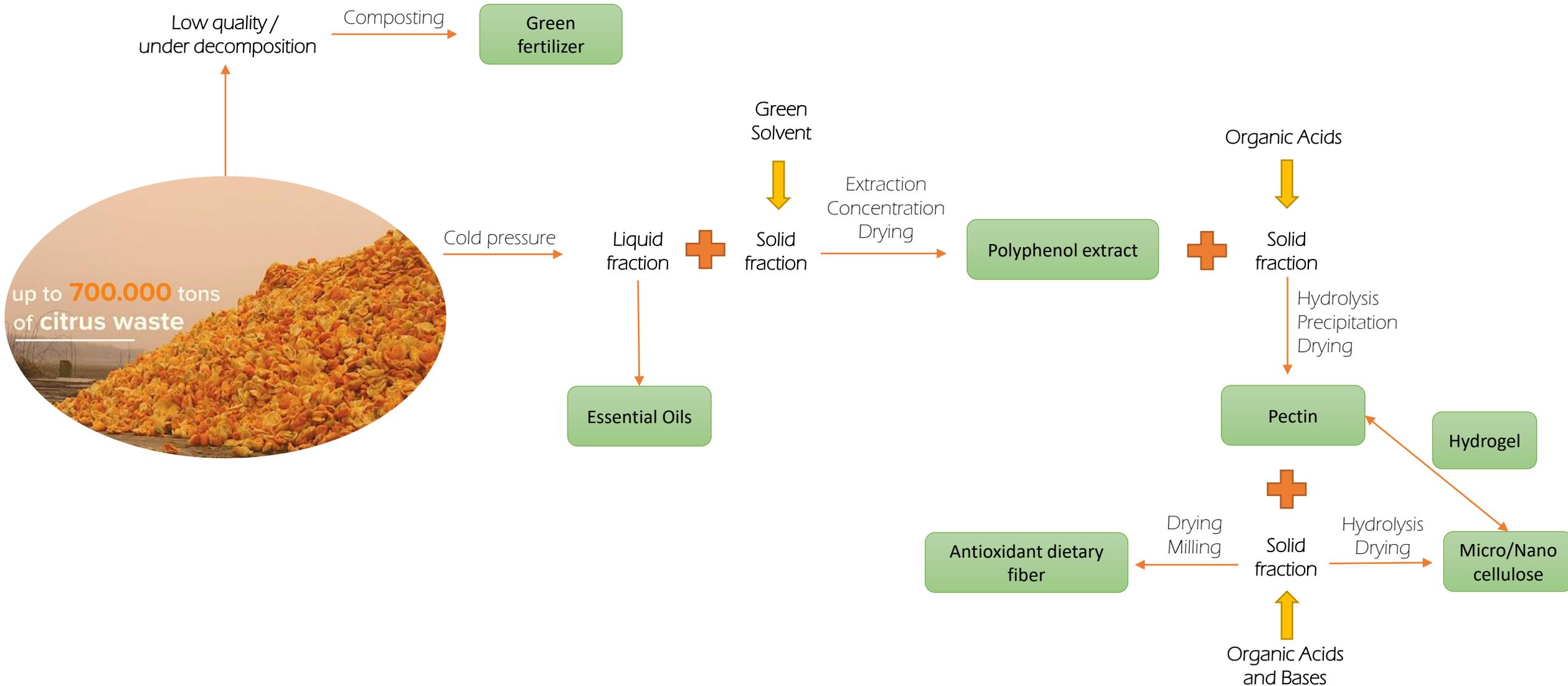
# Work Package 5 Leader UCP



**Valorization of  
all industrial  
wastes in order  
to extract, using  
green  
procedures,  
bio-functional  
molecules**



# Integrative and Sustainable process



# What is the industrial potential of these value-added molecules?

## Food products

- ✓ Pectin
- ✓ **Natural Food additives:** the essential oil and polyphenol extracts could be a natural alternative to the food additives
- ✓ **Antioxidant dietary fiber:** to develop new functional products rich in fiber
- ✓ **Healthy snacks and functional beverages**

- ✓ **Hydrogels for cosmetics and biomedical** application for controlled release of active ingredients;
- ✓ **Anti-aging cosmetics:** the polyphenol extracts due to their antioxidante activity could be incorporated in cosmetics;
- ✓ **Dietary supplements:** antioxidant fiber and polyphenols have high market demand due to its human benefits.

## Pharmaceutical and nutraceutical products

## Environmental products

- ✓ **Green pesticide:** the polyphenol extract and essential oil could be used against phytopathogenic bacterium and fungi;
- ✓ **NPK fertilizers:** micro/nanocelulose hydrogels could be used to absorb and retain a significant amount of water, improving the water-holding capacity and/or nutrient retention of sandy soils;

# PhD Thesis

## Integrative approach of orange peels valorization into a multifunctional ingredient



Develop an OP sustainable valorization to obtain bioactive ingredients



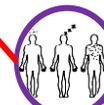
Create a multifunctional product based on individual ingredients



Study the Gastrointestinal impact on bioactive ingredients



Study of bioactivities including the gut microbiota modulation



Human Clinical Trial – health benefits of supplementation

# WASTE WITH € VALUE

≈25%



## 50%

ORANGE WEIGHT  
ARE WASTED



## SOURCE OF BIOACTIVE COMPOUNDS

Phenolic compounds

- Flavonoids – **HESPERIDIN**
- Phenolic Acids
- Carotenoids

Dietary Fibers

- Soluble – **PECTIN**
- Insoluble – cellulose, hemicellulose and lignin



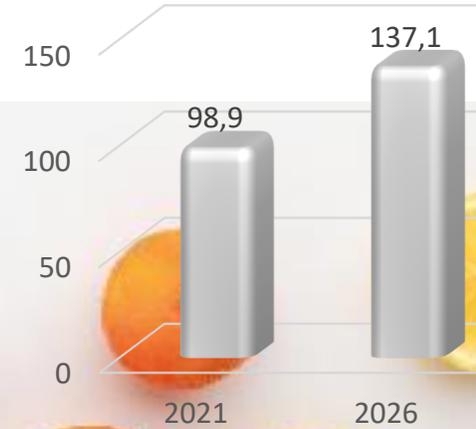
**Pectin:** reduce glucose and cholesterol absorption and modulator the colonic microbial composition and activity.



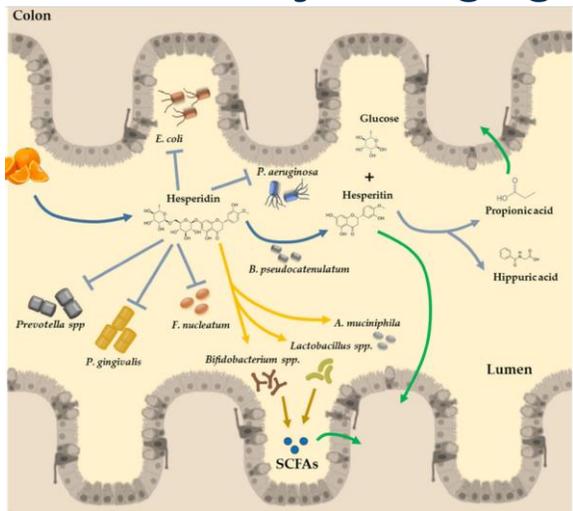
**Hesperidin:** strong antioxidant activity, anti-inflammatory activity, anti-proliferative, anti-viral (COVID-19)...  
Recent evidences highlights hesperidin as microbiota composition modulator.

# WASTE WITH € VALUE

## Functional food ingredients



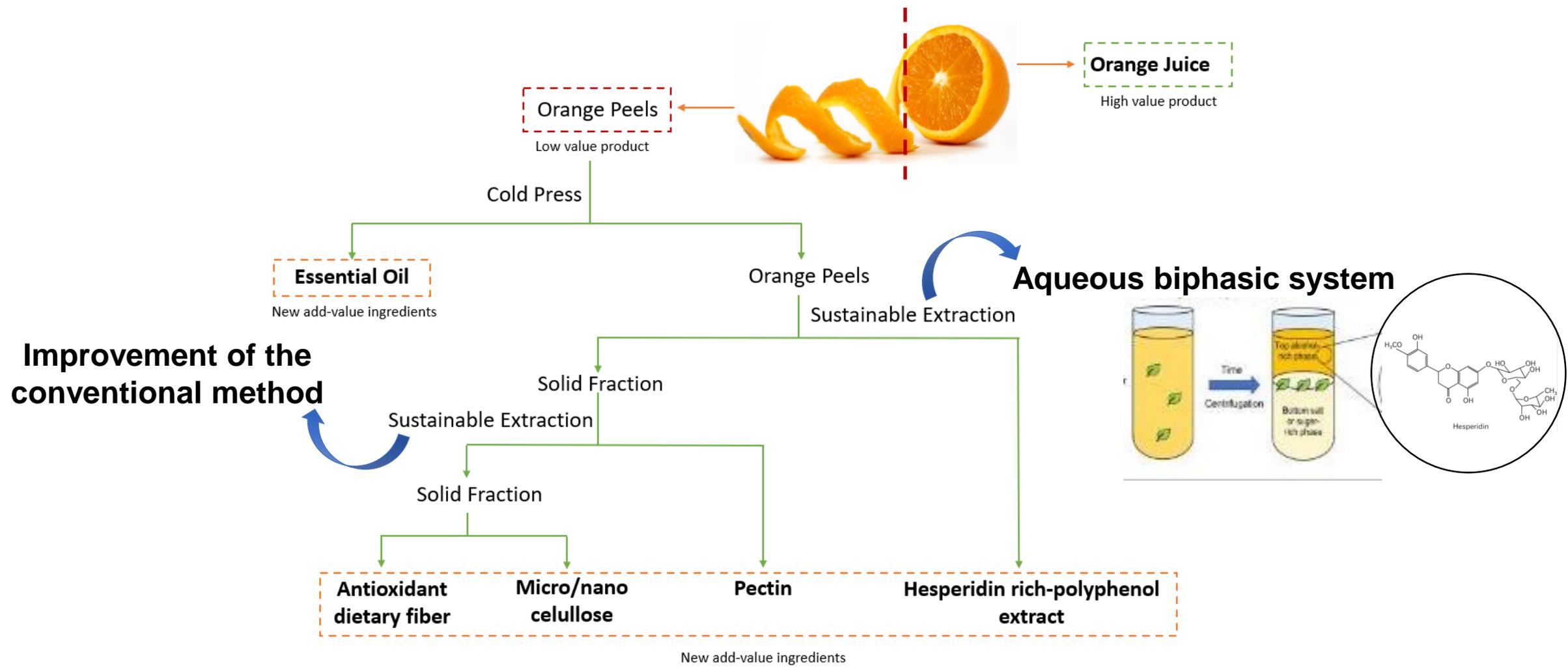
- ✓ Integrated value-added food supplement
- ✓ that induces a positive impact on human gut health, mainly through gut microbiota modulation.



Hesperidin rich-polyphenol extract
+
Pectin  
Micro Cellulose
=
Food Supplement



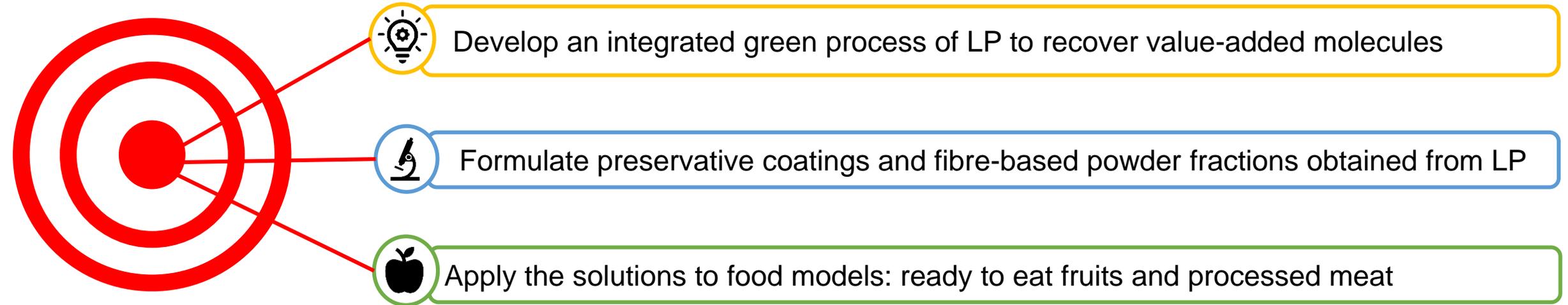
# Integrative approach of OP valorization



Improvement of the conventional method



## Integrative approach of lemon peels valorization: clean label solutions for food preservation



# WASTE WITH € VALUE



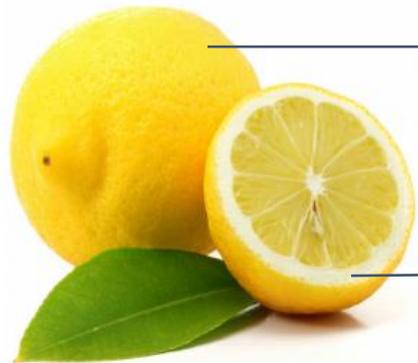
124.2 million tons of Citrus production per year

Lemons and limes: 15.9 million tons

Citrus fruit processing generates a huge amount of losses and waste (peels, seeds, pulps)

50% of the raw processed fruits

Valorization of those by-products increases the potential return and helps preserving the environment



Flavedo

Flavonoids (mainly eriocitrin and hesperidin)

Phenolic Acids

Carotenoids

Essential oils (EOs)

Albedo

**Dietary fibers:**

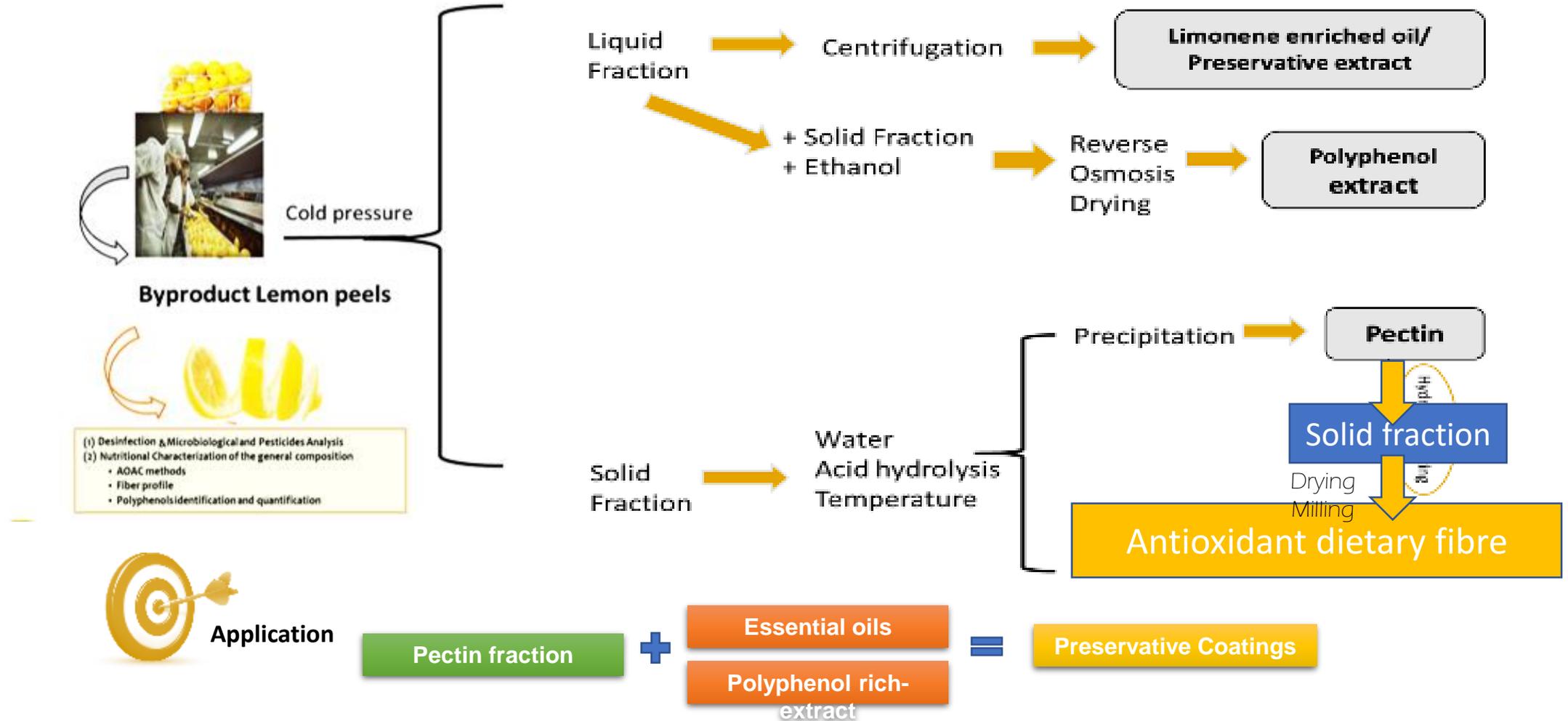
- Soluble: Pectin

- Insoluble: cellulose, hemicellulose and lignin

## Bioactive properties:

- antimicrobial (mainly antibacterial and antiviral)
- anti-inflammatory
- antiallergic
- antioxidant activities

# Integrative approach of lemon peels valorization



# Acknowledgements

MEDISMART TEAM

**Thank you for your  
 attention!**

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