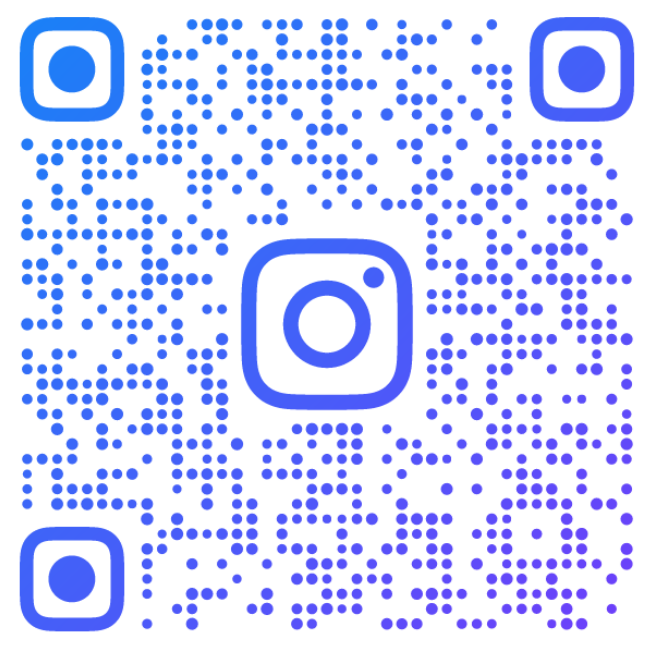


# Design and scaling of a circular economy sequential bioprocess for the conversion of orange peels waste into agronomic bio-stimulants / biofertilizers

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@PLANTBIOSTIMULANT



Production 76 millions tons annually  
In Europe alone, around 37% of the vegetables produced are wasted, Most of the waste is destined for animal feed.



**ORANGE PEEL**  
ORGANIC COMPOSITION:  
HIGH CARBON CONTENT  
BIOACTIVE COMPOUNDS  
LOW BIODISPONIBILITY

The project proposes the development of biphasic sequential bioprocesses: Enzymatic plus Lactic bacteria fermentation, for the conversion of WF-HFP into new bio-stimulants and the functional characterization of the experimental products designed, through the application of evaluation models of bio-stimulant potency.

## 1. BIOSTIMULANT PRODUCTION

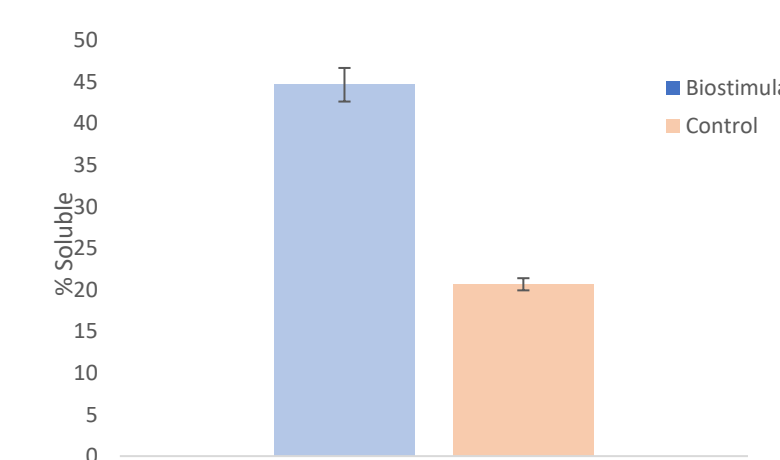
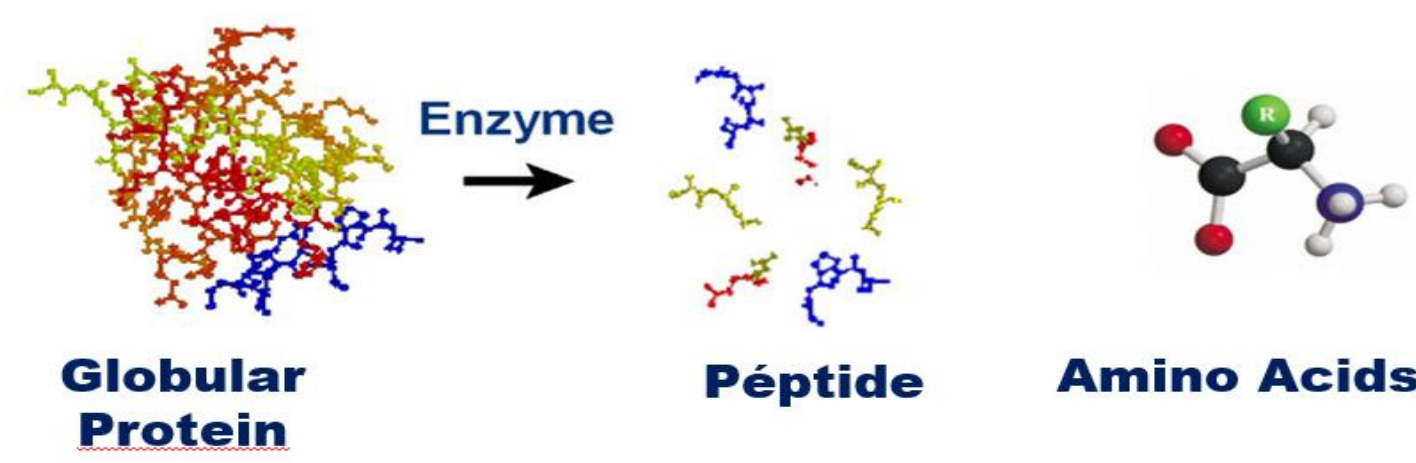
(ENZYMATIC HYDROLISIS)



### SEQUENTIAL ENZYMATIC PROCESS

#### 1 Glycosidases      2 Endoproteases

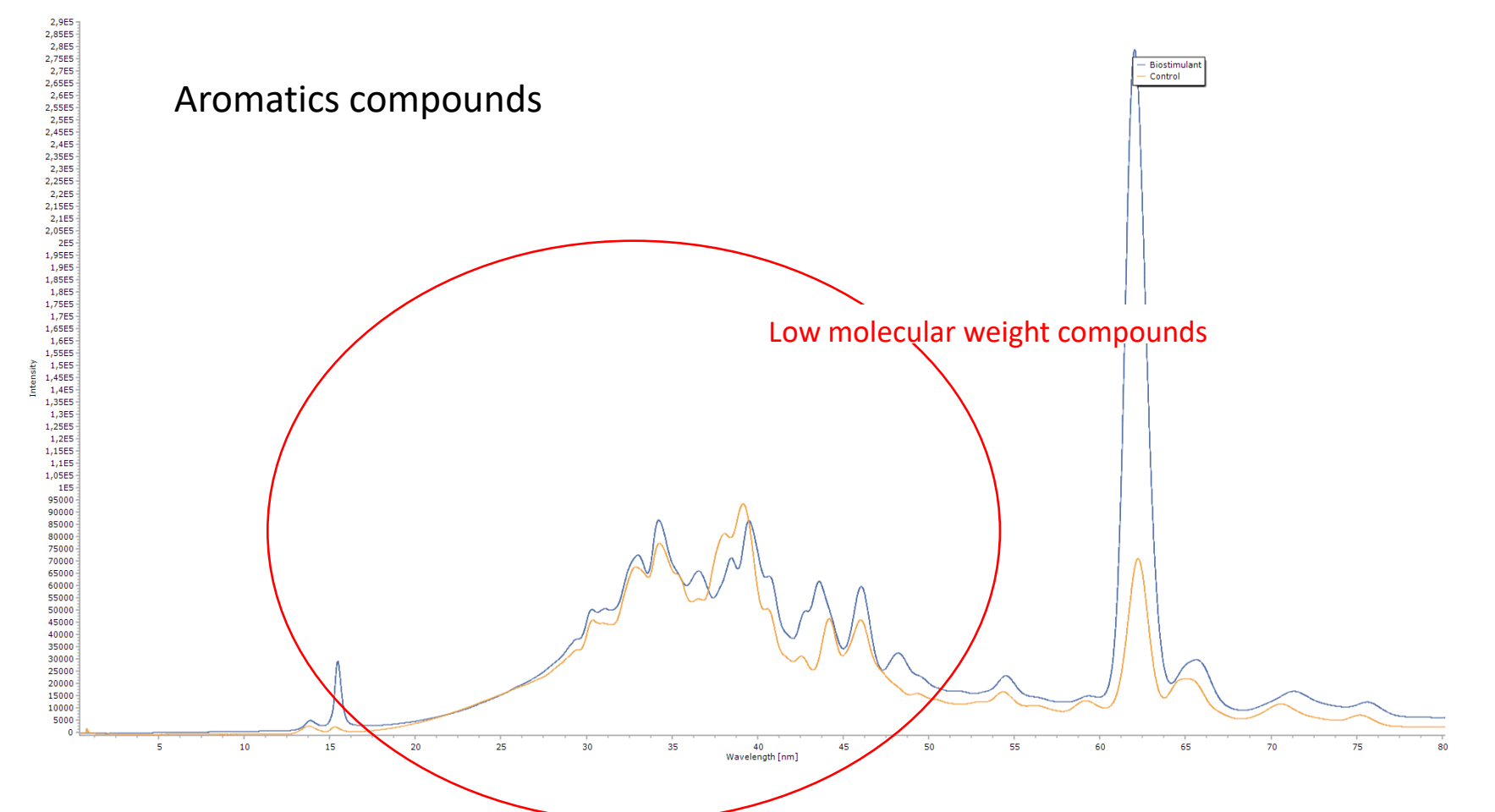
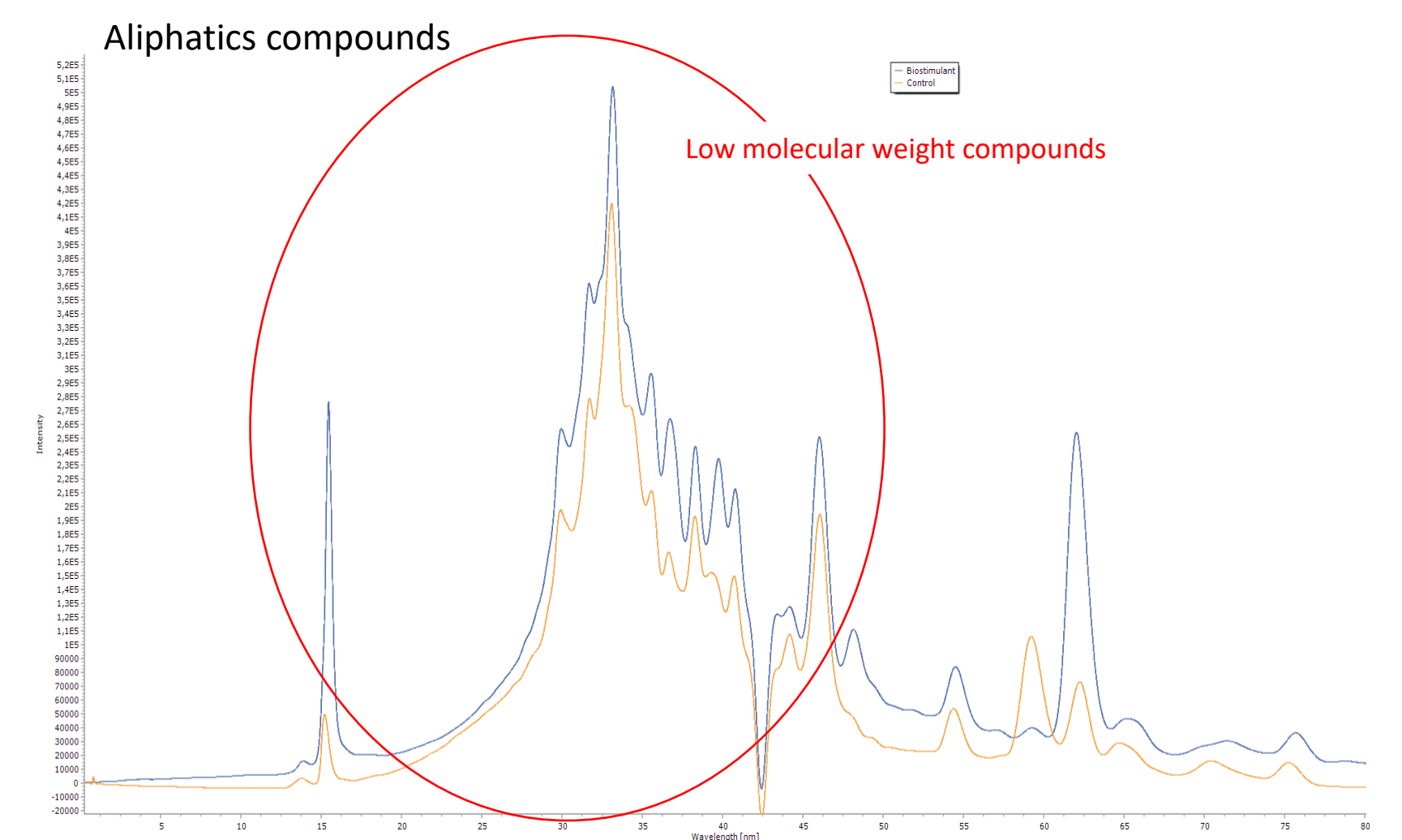
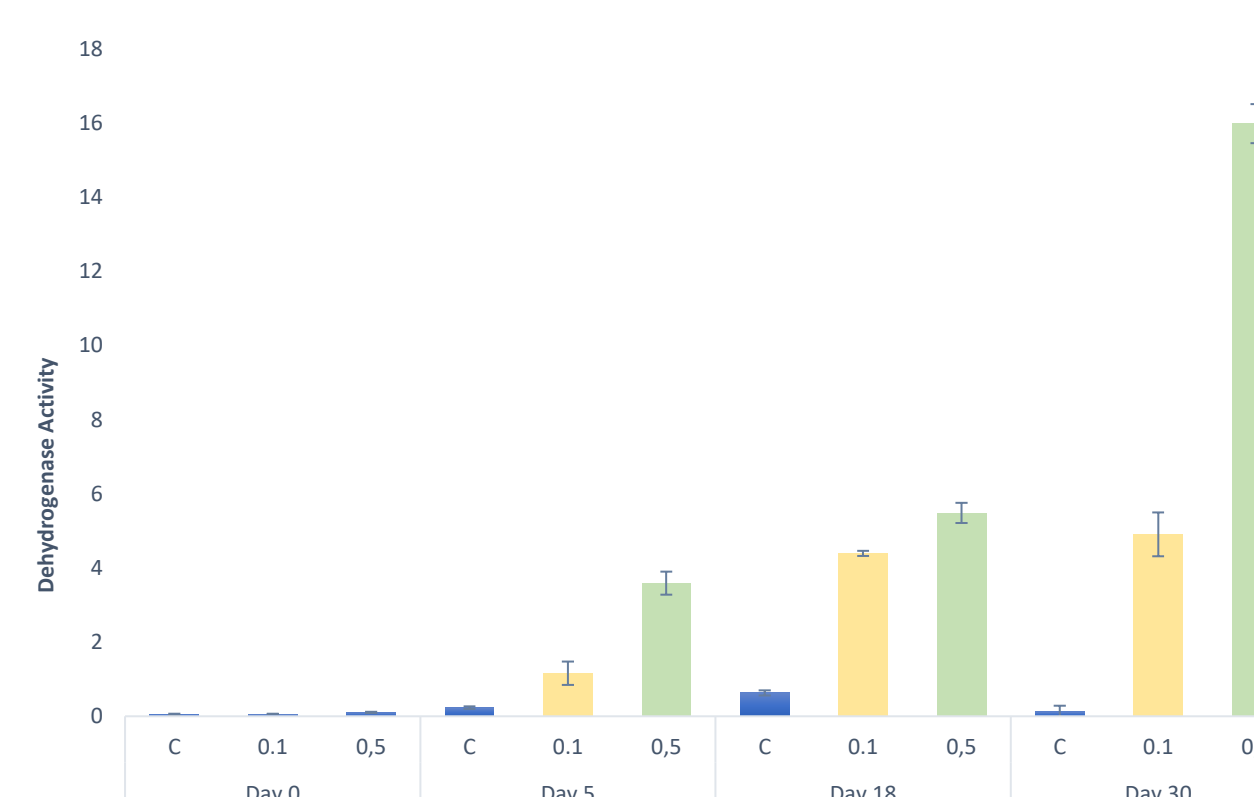
- Arabinase
- Célulase
- Pectinase
- Arabinase



Increased solubility of the starting product due to increased availability of sugars and peptides

#### Application in soil

Dehydrogenase activity in soil is linked to soil fertility  
An increase in biostimulation was observed.



## 2. BIOFERTILIZER PRODUCTION

(LACTICBACTERIAL FERMENTATION)



*Bacillus Sonorensis*

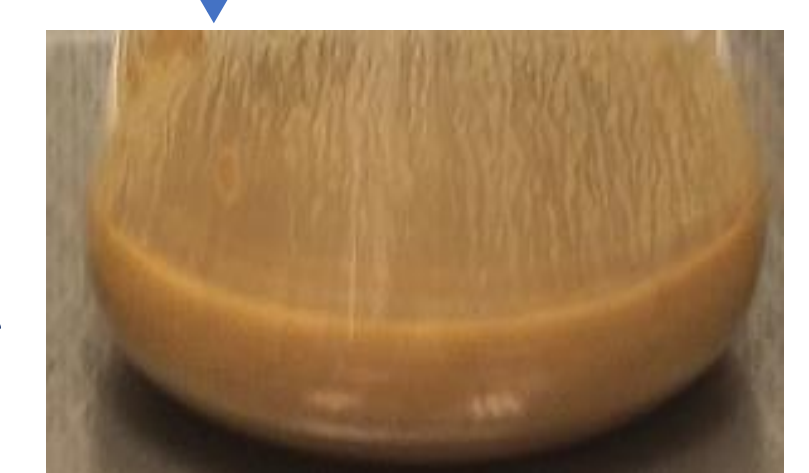
### BIOFERTILIZER BACTERIA

*Bacillus Sonorensis*

### NITROGEN FIXATION

- DNAase
- AMYLASE
- PROTEASE

10<sup>8</sup> ufc/ml of Plant Growth Promoting bacteria (PGPb)



**1** Isolation of endogenous peel waste PGPB bacteria

**2** Evaluation PGPB potential

DNAase, Amylase, protease and nitrogen fixation.

**3** BIOFERTILIZER

## Conclusions

Our two-stage process transforms orange peel waste into a BIOSTIMULANT through a first enzymatic hydrolytic phase.

This biostimulant can then be converted into a BIOFERTILIZER through a second fermentative phase using a PGPb isolated from the orange peel waste (*Bacillus sonorensis*)