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## Conversion of food processing residues into sustainable soil improvers by using enzymatic hydrolysis

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### Background



In the EU, about 60 million tons of food waste are generated annually<sup>1</sup>. So, to achieve a more sustainable future for the global population, food waste and loss need to be reduced<sup>2</sup>. To do so, converting food processing residues into new valuable products represents a key solution.



Turning food processing residues into soil improvers represents a way forward to valorise food waste. Residues which possess a high nitrogen content could be recovered by applying enzymatic hydrolysis protocols to obtain liquid protein hydrolysates directly used in the field.

### Objectives of the study

This study has been developed in the frame of the European-funded project Waste4Soil (Project: 101112708 -HORIZON-MISS-2022-SOIL-01). The main aims of the project are listed as follows:

- Development of methodological and technological solutions to convert food processing residues into local, biobased circular soil improvers
- Characterization of food processing residues
- Production and optimization of different protein hydrolysates from different food processing residues
- Evaluation of protein hydrolysates as soil improvers considering technical, legal and economic aspects

### Contents

#### 1 Sample selection and Characterization of Food Processing Residues

##### Selected samples



- ▶ **Poultry residues** - chickens that died before slaughter from causes other than disease (**P**)
- ▶ **Residual sludge** from the biodigestion process (**S**)
- ▶ **Organic okara** from the production of soy drinks (**O**)

##### Key Results 1: Proximate co

Food processing residue	Moisture (%)	Total N (%)	Total Protein (%)	Lipid content (%)
Poultry residues	64.46±0.09	10.48±0.19	65.48±1.03	30.84±0.12
Residual sludge	29.74±0.14	7.33±0.07	44.56±0.41	6.66±0.12
Organic okara	73.55±0.64	5.86±0.14	33.27±0.82	17.84±0.12

Table 1. Results of chemical analyses of (g/100 g dry weight)

#### 2 Production and optimization of different protein hydrolysates from different Food Processing Residues

##### Hydrolysates production

Protein hydrolysates on different food processing residues were obtained by using different proteases: Endocut 07L<sup>®</sup>, Alcalase<sup>®</sup> and Papain

Analytical characterization of hydrolysates: % N, % protein yield and degree of protein hydrolysis (DH%)

##### Key Results 2: Protein yield and DH % after hydro



Figure 1. Protein yield (%)

#### 3 Evaluation of protein hydrolysates as soil improvers-In field tes

**Key Results 3: % Nitrogen determined after hydrolysis on chosen enzyme Endocut 07L<sup>®</sup>**  
Poultry residues (**P**): 0.93; Residual sludge (**S**): 0.21; Organic okara (**O**): 0.23.

The most promising hydrolysates (produced using Endocut 07L<sup>®</sup>) are being tested in field directly on wheat and tomato as soil improvers

### Conclusions

- Endocut 07L<sup>®</sup> exhibits good efficacy on all tested residues.
- Poultry residues (after hydrolysis) showed a similar % of Nitrogen as compared to the standard treatment.
- The results obtained with the produced innovative soil improvers will be compared to a standard treatment (C+) and an untreated control (C-), to evaluate the efficacy of the treatment.

### References

1. Eurostat, 2023. [https://ec.europa.eu/eurostat/tgm/table.do?n=1&code=sdg\\_12\\_2.1&plugin=1&lang=en&n8=category=env.env\\_was](https://ec.europa.eu/eurostat/tgm/table.do?n=1&code=sdg_12_2.1&plugin=1&lang=en&n8=category=env.env_was)
2. Fiore et al., 2019. 10.3280

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