Beyond compost: Using urban biowaste derived compost to produce new fertilizing products

Telmo Machado[1], Carolina Santos[2], Délio Raimundo[3], Benedita Chaves[1]

[1] LIPOR, Serviço Intermunicipalizado de Gestão de Resíduos do Grande Porto, Rua da Morena, 805 | 4435-746 Baguim do Monte, telmo.machado@lipor.pt, benedita.chaves@lipor.pt; [2] ISEP, Instituto Superior de Engenharia do Porto—Politécnico do Porto; [3] CAMPOTEC IN – Conservação e comercialização de hortofrutícolas S.A.

1. Motivation

The agro-food sector is a contributor to CO_2 emissions and polluter due to its difficulty to deal with waste generation. Using the *farm to fork* concept we can observe that waste is produced in every link of the food value chain. Nevertheless, efforts are being made worldwide to reduce its environmental impact - from producing food with precision agriculture to sustainable food packaging systems – hoping to influence the way each country manages its biowaste. In this work we present the first results of an experiment, conducted under the project "BIOMA – Bioeconomy integrated solutions for the mobilization of the Agro-food market", to produce a Urban waste compost based plant biostimulant.

2. Objectives

O1: Compare the composition of different Biostimulant production methods

O2: Evaluate the effectiveness of a Biostimulant produced from Urban Waste Compost

O3: EcoDesign performance of the new Biostimulant

3. Materials and Methods

Compare the composition of different Biostimulant production methods - Comparison between the biostimulant produced from compost and from the compost co-products (rejected material from pelletizer) and using fresh water and leachate from the composting facility (Green Waste leachate); For each sample, the Total Organic Carbon and Inorganic Carbon was determined.

Table 1 - tested biostimulant formulas

Formula	Non-aerated	24h aeration
Compost co-products + fresh water	B1	B1A
Compost co-products + Green waste leachate	B2	B2A
Compost + fresh water	B3	B3A
Compost + Green waste leachate	B4	B4A

Evaluate the effectiveness of a Biostimulant produced from Urban Waste Compost - Field trials used common lettuce (*Lactuca sativa*) with 2 doses of application and 2 different concentrations (40% and 100% biostimulant); For each sample the size and number of leaves was determined.

EcoDesign performance of the new Biostimulant - The EcoDesign performance evaluation was conducted using "Design for Sustainability Checklists", a tool developed in the project "SInnDesign: Sustainable Innovation through Design". This tool provides a qualitative analysis integrating environmental, social, and economic criteria through 8 principles related to the different product life cycle phases. Since this methodology is always applied by comparison to an existing product, the chosen reference product was PROFERTIL - an algae based biostimulant (Ascophyllum nodosum) with potassium oxide (3%) produced and marketed by ADP PORTUGAL.

Figure 1– Biostimulant production method

4. Results

4a - biostimulant production methods and formulas

Table 2 - TOC and IC results (mg/L)

Formula	TOC (mg/L)	IC (mg/L)
B1	1181	329,7
B1A	1167	417,0
B2	1487	386,6
B2A	965	450,3
B3	3807	431,0
B3A	2281	782,4
B4	5557	573,8
B4A	4478	2510

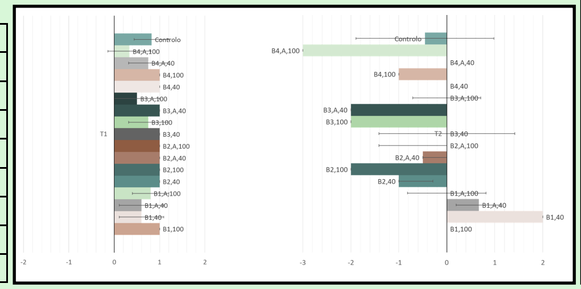

Figure 2 - Variation on the number of visible leaves

4b - EcoDesign results

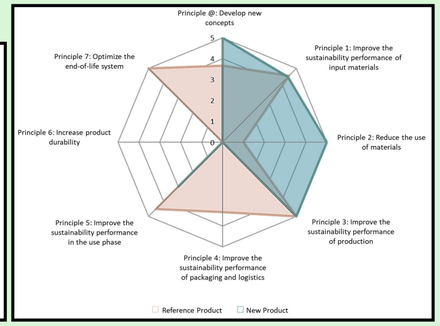

Figure 3 - EcoDesign diagram

5. Conclusions and next steps

Conclusions

⇒ The formula using compost and leachate produces the richest solution, having 5557 mg/L TOC and 2510 mg/L IC.

⇒ Aeration of the solution for 24 hours led to a reduction in TOC by 40% and an increase in CI by 338% → increase in microbial load, which indicates a possible increase in biostimulant effect.

⇒ The product presents good sustainability indicators, having achieved the best result in 80% of the Eco-Design tool principles.

Next steps:

⇒ Additional plant growth tests.

⇒ Determining product stability and durability (shelf life).

⇒ Product characterization, including microbiological and chemical analysis.

⇒ Development of a package in line with the principles of Eco-Design.

Acknowledgments

Conducted under the project "BIOMA – Bioeconomy integrated solutions for the mobilization of the Agro-food market" (POCI-01-0247-FEDER-046112), by "BIOMA" Consortium, and financed by European Regional Development Fund (ERDF), through the Incentive System to Research and Technological development, within the Portugal2020 Competitiveness and Internationalization Operational Program.

This poster was presented at the ISWA World Congress 2022, Singapure