Rome, February 18th-19th, 2025





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Biological valorisation of a vermicompost as biostimulant for horticulture

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Rome, February 18th-19th, 2025



Aim of the experiment

Phase 1 :Biologicalenrichmentofavermicompostforthepreparationofabiostimulant

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Phase 2: Verify biostimulant properties on a plant species of agro-food interest, *Lactuca sativa capitata* (iceberg lettuce).

Economic valorisation of the product



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Definition of biostimulant

Plant biostimulant must improve: nutrient use efficiency

tolerance to abiotic stress

enhancement of qualitative plant traits

The **Regulation (EU) 2019/1009** classifies biostimulants into two main categories:

- Microbial biostimulants
- Non Microbial biostimulants

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Biological enrichment of the vermicompost by selected plants







Gramine: hosts of free nitrogen fixers

Legumes: hosts of symbiotic nitrogen fixers







Asteraceae: may interact with associative nitrogen fixing bacteria

Rice + Lentil mix



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Phase 1





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Phase 1



Microbiological Characterization of Substrates





B. CFU of presumed nitrogen-fixing

End of Phase 1

Selection of the most performant plant species:

Alfalfa

Grinded roots added to the vermicompost to obtain biostimulant

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Phase 2



Effects of biostimulant on Lactuca sativa capitata (iceberg lettuce)

Evaluate the effect of biostimolant on plant growth and physiolocical characteristics

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Phase 2:

Clinoptilolite zeolites were integrated into the biostimulant (3% w/w) The control substrate was a sandy substrate based on neutral peat (pH 7.49)

2 different biostimulant application dosages were tested:



10% w/w



C5-1a =23

C10-1a =20 C5-1b =2 C10-1b =22 C5-1c =5 C10-1c =27 C5-2a =32 C10-2a =12 C5-2b =14 C10-2b =34 C5-2c =18 C10-2c =15





| 🔵 TS-1 a =4 |
|--------------|
| 🔘 T5-2 a =6 |
| 🍥 TS-3 a =16 |
| 🔘 T5-4 a =17 |
| 🔵 T5-1 b =3 |
| 🔘 T5-2 b =1 |
| 🔘 T5-3 b =30 |
| 🔘 T5-4 b =28 |
| 🌑 T5-1 c =9 |
| 🍥 T5-2 c =21 |
| 🔘 T5-3 c =10 |
| 🔘 T5-4 c =33 |
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Phase 2

Zeolite clinoptilolite are hydrated aluminosilicate with multiple characteristics.



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Adsorption and slow release of chemicals (CEC)

Water Adsorption / release



Three-dimensional structure







The 5% integration has led to excellent results



The 5% integration showed the best effects on the plant



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Phase 2

Parameters related to oxidative stress in plants

Flavonoids, polyphenols and DPPH (1,1-diphenyl-2-picryl-hydrazyl)



Treated plants show a higher content of **polyphenols**, **flavonoids** and a high **total antioxidant capacity**

DPPH b b 90 90 80 70 60 60 50 40 30 20 10 C5 C10 T5 T10

The **5%** treatment showed less oxidative stress

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Conclusions:

Phase 1

Alfalfa showed the greatest enrichment capacity in N substrate bacteria

The 5% treatment showed a biostimulant activity comparable to 10%.

Phase 2

The application of the **5%** biostimulant determined:

- Increase in plant biomass
- Greater plant resistance to oxidative stress
- More efficient use of nutrients

The developed product can be classified as biostimulant with a significant increase in economic value compared to the starting vermicompost Vermicompost = 1 €/kg Biostimulant= 40-120 €/kg

Thank you!

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