A NEW BIOSTIMULANT/BIOFERTILIZER PRODUCT OBTAINED FROM WHEY: EFFECT ON SOIL BIOLOGICAL PROPERTIES

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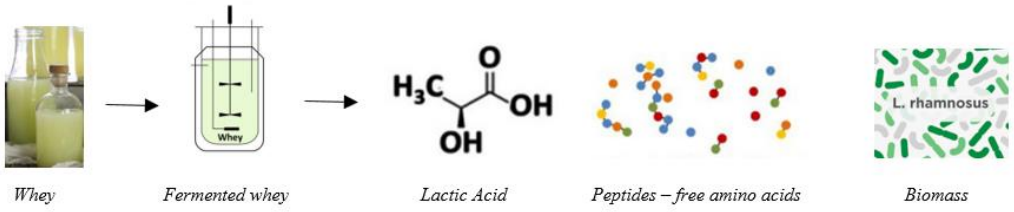
ABSTRACT

This work presents the design of a circular process allows the whey valorization by converting it into biostimulant and biofertilizer products for environmental/agronomical purposes. Whey is produced in large volumes and presents problems of environmental management. This process can be the base of new industrial lines of production of biostimulants that would meet the growing agricultural demand sustainably, optimizing investments, and improving the crop yield and quality, with the increased benefit of reducing environmental impacts of inorganic fertilization.

The core of this bioprocess is a whey fermentation by Lactobacillus rhamnosus, a bacterial species within the group of plant growth promoting bacteria (PGPB), The Fermentation leads the production of soil biostimulants as L-LACTIC ACID, PEPTIDES AND FREE AMINO ACIDS and the generation of soil PROBIOTICS with biofertilizer capacity.



The primary objective of this study is to investigate the soil's capacity for biostimulation through the application of fermented whey. To achieve this, fermented whey was applied to a Plagic Antrosol, and its effects on various chemical and biological parameters were analyzed. These parameters include soil pH levels, the lactic acid during the assay, and soil enzymatic activities such as dehydrogenase, phosphatase, and glucanase. Additionally, the study examined the impact of fermented whey on soil biodiversity and the taxonomic composition of microbial populations using 16S rRNA Metabarcoding.

The application of fermented whey initially led to a temporary decrease in pH, which was subsequently reversed during the assay period due to mineralization by microorganisms present in the soil. This resulted in an increase in microbial enzymatic activities and alterations in the structure of bacterial communities.

In a related context, a metagenomic analysis of the soil following treatment with the fermented product revealed noteworthy findings. Specifically, there was an observed increase in prokaryotic taxa associated with organic matter recycling, The observed enhancements in various biological markers and modifications in soil microbiota, particularly the stimulation of PGPB microorganisms such as Rhizobium, Stenotrophomonas, and Lysinibacillus, underscore the potential utility of fermented whey as a bioestimulant in agriculture. These changes favoured the proliferation of microorganisms involved in biodegradation processes and soil fertility enhancement. This capacity to stimulate beneficial microorganisms suggests promising applications in biocontrol systems.

CONCLUSION

As a conclusion the functionality of a new biostimulant/biofertilizer obtained through a circular economy process of whey has been studied in the biochemical and microbial properties of the soil, showing a positive effect on the chemical an microbiological soil structure linked to fertility parameters

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