

Electrostatically cross-linked chitosan nanoparticles intended for agricultural use

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Chitosan (CS) is an abundant cationic natural biopolymer derived by the alkaline N-deacetylation of chitin [1]. It is biocompatible, non-toxic, has antimicrobial properties and acts as a phytostimulator (elicitor), inducing plant defense mechanisms and preparing them for impending attack by bacteria, fungi and viruses [2]. Therefore, its potential use in agriculture for the control of pathogens constitutes a promising alternative to traditional chemical fertilizers and pesticides that raise concerns related to public health, environmental protection, and development of resistant pests [2].

In this work we report on the preparation of chitosan nanoparticles (CS-NPs) utilizing electrostatic cross-linking with suitable organic molecules (e.g., tannic acid), that can be subsequently loaded with organic/biological substances, relevant to their intended agricultural use (i.e., adjuvants, metabolites, etc.). Different formulations in regard to CS concentration, mixing ratios, and preparation protocols were investigated aiming to the development of stable nanosized products. The resulting nanoparticles were characterized as to their mass, size, size distribution and effective charge by dynamic and electrophoretic light scattering (DLS and ELS). Further structural insight was obtained through UV-Vis and fluorescence spectroscopic measurements.

Overall, the produced chitosan nanoparticles exhibit favorable properties that deem them suitable for use in agriculture, where they can act as a means of controlling plant diseases and at the same time improve plant health.

Keywords: chitosan, nanoparticles, cross-linking, plant health

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References

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