PÔSTER - RESUMO - MATERIAIS E BIOMATERIAIS

NANOCOMPOSITE-BASED SOIL CONDITIONER: STARCH/NANOCLAY

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Projections indicate continuous population growth, leading to greater food demand and putting pressure on increasingly exhausted arable land. Soil conditioners are proving to be a good alternative in the search for greater soil efficiency, aiming to increase its productivity in order to meet the growing global demand for food. In this sense, thermoplastic starch (TPS) presents promissing characteristics for this purpose, while nanoclay (NC) demonstrates potential to reinforce its polymeric network, generating new properties. Thus, these low-cost materials were combined for the development of optimized formulations in proportions of 3%, 5% and 7% (w/w) of NC in relation to TPS. FTIR experiments demonstrate that structural modifications occurred in the material when the two components were mixed, with greater intensity in TPS/NC7%, being visible in SEM images. The TPS/NC7% sample was the one that swelled the most compared to TPS, especially in slightly acidic and neutral media, being 32%, 39% and 21% at pH 5, 7 and 9, respectively. It was also the TPS/NC7% sample that had the lowest solubility, mainly in slightly acidic and slightly basic media, being 30%, 25.4% and 24.4% for the respective pH 5, 7 and 9. The neutral pH of the nanocomposites can guarantee their use in a wide variety of soils. The cation exchange capacity (CEC) was also superior in the nanocomposites compared to TPS, with a higher value in TPS/NC7%, indicating

greater availability of nutrients to the medium in which they were found. As such, TPS/NC7% was subjected to further experiments. Thus, performance tests of leaching, biodegradability, microbial activity, and planting show that TPS/NC7% is the composite that presents a better release of NPK ions, as well as a statistically lower release of CO2, a positive trait that indicates slower biodegradability and more soil persistance for continuous fertilizer release, and proliferation of microorganisms, and greater productivity in seedling growth, reducing the effect of dormancy in seeds. Finally, the TPS/NC7% composite stood out from the others and showed a product that not only indicated the improvement of the physical-chemical properties of the soil, but also economic viability and sustainability. In this way, the present work also contributed to more sustainable and efficient agricultural practices.

References:

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Palavras-chave: soil conditioner; nanoclay (nc); thermoplastic starch (tps); nanocomposites; agriculture.