

Green nanocomposites as carriers for slow-release of tebuconazole

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Nanotechnology applications in the agricultural do not demonstrate a sufficient economic return to counterbalance the high production costs [1]. An interesting approach will be if inexpensive materials were used in order to prepare nanocomposites able to control the release rate of biocides. Biogenic nanosilica and cellulose were chosen to prepare a nanocomposite that will be applied as carrier for slow release of tebuconazole. Briefly, biocide entrapment was performed as follow: biogenic silica and tebuconazole were stirred, then a suspension of cellulose nanofibrils was added and kept stirring for a determined time. The nanocomposite was dried after centrifugation. The characterization was performed by using infrared spectroscopy (FT-IR), thermogravimetric analysis (TGA), scanning electron microscopy (SEM) and X-ray micro tomography (Micro-CT). The release profiles were obtained by placing a known mass of biocide inside a known volume of water, then aliquots were taken at determined times for measuring the tebuconazole concentration. FT-IR and TGA revealed that biocide was entrapped in the cellulose/silica nanocomposites. SEM and Micro-CT showed the microstructure of the nanocomposites based on irregular shape nanosilica coated by cellulose nanofibrils in a randomly organized network. The cellulose nanofibrils played an important role in the release rate of the biocide mainly at short-term periods. At 15 days of immersion, the biocide had 95% released compared with 30-45% released of the nanocomposites.

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References:

[1] C. Parisi, M. Vigani, E. Rodríguez-Cerezo, Nano Today vol. 10, 124-127 (2015)