

FePO₄ nanoparticles as an effective tool for plant nutrition: from the lab to the field

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An industrially-scalable method for FePO₄ NPs synthesis was set up also optimizing stabilization on long time periods. The system was patented by FCP Cerea.

FePO₄ NPs were first tested hydroponically for the delivery of P and Fe on two crop species, cucumber and maize. The results showed that FePO₄ NPs improved the availability of P and Fe, if compared to the bulk FePO₄, as demonstrated by morpho-physiological parameters and the determination of nutrients concentrations in tissues. However, nutrients availability is strongly influenced by the crop species used. The particles size enhanced P availability for cucumber plants, while in maize the material's size improved Fe availability. TEM observations revealed that FePO₄ NPs do not enter into roots, suggesting as mechanism of nutrients delivery the dissolution at roots surface. Unlike Fe-EDDHA, FePO₄ NPs showed to not leach through soil profile, a necessary feature for slow release fertilizers. Interestingly, the application of FePO₄ NPs on two soils did not evidence toxicity effects as resulted by the analysis of soil enzyme activities, DGGE and BioTox® test.

Open field trials on Kiwi orchard (Jintao yellow variety) were performed using FePO₄ NPs-based nanofertilizer produced by FCP Cerea (Nano.T Fe®). Nano.T Fe® was as effective as Fe-EDDHA even if applied at half the rate of the latter.