

Assessment the effect of functionalized nano-zeolites application on Potassium phosphate and nitrate leaching and quantitative and qualitative yield of bean

Abstract

In order to reduce contamination of surface and ground water, and to minimize the risk of diseases caused by nitrates and phosphates in surface, subsurface and drinking water, separate experiments were done to investigate the effects of nitrogen and phosphorus on the qualitative and quantitative characteristics of beans in factorial, in a completely randomized design with 4 replications of 93 agricultural research center in Hamadan province. Treatments, first test, includes 4 nitrogenous fertilizers: X₀ (Control samples not using fertilizer), X₁ (zeolite - EN), X₂ (zeolite - AcAcEN), X₃ (zeolite -HED) and X₄ (urea) and two varieties of beans including Red beans (*phaseolus vulgarize L*) and cowpea (*Vigna unguiculata L.*) and in the second experiment, the treatment consisted of 4 types of fertilizer phosphorous; P₀ (Control samples are not used fertilizer), P₁ (zeolite - EN), P₂ (zeolite - AcAcEN), P₃ (zeolite - HED) and P₄ (triple super phosphate fertilizer) was performed. The results showed that the use of highly functionalized nano-zeolite fertilizers reduce nitrate leaching test units (pots). However, the amendments made fertilizers X₃ nano-zeolite with 61% reduction of nitrate to urea leaching of nitrate has the leaching least. Based on the findings, zeolite X₃ fertilizer could improve the growth characteristics, biomass and qualitative characteristics of plants such as chlorophyll, protein, grain, harvest index, grain yield and biological function of the bean plant. The findings of the second study showed that the use of zeolite nanoparticles functionalized with phosphorus fertilizers improve the quantity and quality of the bean plant. However, in the amendments that made within 3 fertilizer, nano-zeolite P₃ had greatest impact on the measured parameters than plant beans. However, the rate of red bean variety was superior to cowpea rate. In general, the use of functionalized nano-zeolites has effective role in reducing nitrate leaching and improved growth characteristics, biomass and qualitative attributes of the bean plant. In summary, the use of zeolite nanoparticles functionalized with nitrogen and phosphorus has useful role in improving the growth characteristics, biomass and qualitative and quantitative characteristics of the bean plants.

Key word: Nitrogen, phosphorus, zeolite, leaching, quantitative and qualitative characteristics beans



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