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Effect of mycorrhizal fungi on thiamethoxam uptake and respective residue levels on guttation

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Abstract

The aim of this work was to study the influence of microbial biostimulants on the residue levels of the neonicotinoid insecticide thiamethoxam on maize guttation. A three-year pot experiment (2020-2022) was conducted over the early growth stages of maize (VE-V7) by simulating the application of pesticides and biological factor on that growth stages. Three replications of each treatment: C= Control, E= insecticide application, M= insecticide application plus the use of commercial product of mycorrhizal fungi (AMF) were established. The insecticide and AMF formulations were applied with the use of drip irrigation. Two drip applications were occurred with an interval of 15 days. Maize guttation was collected in 5 different sampling intervals, with the first one just after the second drip application. Samples were directly subjected to a HPLC-DAD analysis by using external calibration solutions. The results revealed that during the 2020 growing season, thiamethoxam concentrations on guttation of E treatment ranged from 0.24 (1st sampling) to 0.55ppm (5th sampling) while in the M treatment ranged from 3.80 (1st sampling) to 0.93ppm (5th sampling). Thiamethoxam concentrations on guttation, during 2021 period, ranged from 0.42 (1st sampling) to 0.74ppm (5th sampling) in E treatment and from 2.25 (1st sampling) to 0.92ppm (5st sampling) in M treatment. During 2022, thiamethoxam residues in maize guttations ranged from 0.26 (1st sampling) to 0.41ppm (5st sampling), and from 2.68 (1st sampling) to 1.02ppm (5st sampling) in E and M treatment, respectively. These results suggest that combined application of commercial product of mycorrhizal fungi (AMF) and the insecticide, significantly increase the concentrations of thiamethoxam in guttation exudates.

Keywords: exudation, HPLC-DAD, maize, pot trials,translocation