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The use of pesticides in agriculture has numerous advantages but also significant environmental drawbacks; The uncontrolled or excessive use of agrochemicals has progressively contributed to the contamination of environmental matrices, and in particular of soils and groundwater. To contribute solving these issues, an eco-compatible nano-formulation was recently developed by the authors to help controlling the environmental dispersion of Dicamba, a herbicide widely used to control broadleaf weeds; Dicamba is highly soluble and moderately volatile, but is less toxic and persistent compared to other competing herbicides. The proposed nano-formulation was developed using eco-compatible, low-cost materials, including natural clays an biopolymers, with the aim to reduce Dicamba volatilization (thus reducing dispersion in air, and consequently potential impacts on both workers and neighboring crops) and solubility (thus reducing infiltration during and after application, and consequently uncontrolled dispersion in the subsoil). In this work, the results of laboratory and greenhouse tests are discussed, comparing the efficacy of the nano-formulation against the pure herbicide compound and a commercial Dicamba-based product, in terms of volatilization, mobility in porous media (both saturated and unsaturated) and efficacy in weed control. The column tests results are modeled using colloid transport software (namely MNMs and Hydrus) and used for the development of a preliminary field-scale model of herbicide application and dispersion in the subsoil. The work was developed in the framework of the project Nanograss, co-funded by Compagnia di San Paolo Foundation.

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