

Photodegradation of Profoxydim Herbicide in Amended Paddy Soil-Water System

Authors : A. Cervantes-Diaz, B. Sevilla-Moran, Manuel Alcamí, Al Mokhtar Lamsabhi, J. L. Alonso-Prados, P. Sandin-España

Abstract : Profoxydim is a post-emergence herbicide belonging to the cyclohexanedione oxime family, used to control weeds in rice crops. The use of soil organic amendments has increased significantly in the last decades, and their effects on the behavior of many herbicides are still unknown. Additionally, it is known that photolysis is an important degradation process to be considered when evaluating the persistence of this family of herbicides in the environment. In this work, the photodegradation of profoxydim in an amended paddy soil-water system with alperujo compost was studied. Photodegradation experiments were carried out under laboratory conditions using simulated solar light (Suntest equipment) in order to evaluate the reaction kinetics of the active substance. The photochemical behavior of profoxydim was investigated in soil with and without alperujo amendment. Furthermore, due to the rice crop characteristics, profoxydim photodegradation in water in contact with these types of soils was also studied. Determination of profoxydim degradation kinetics was performed by High-Performance Liquid Chromatography with Diode-Array Detection (HPLC-DAD). Furthermore, we followed the evolution of resulting transformation by-products, and their tentative identification was achieved by mass spectrometry. All the experiments allowed us to fit the data of profoxydim photodegradation to a first-order kinetic. Photodegradation of profoxydim was very rapid in all cases. The half-lives in aqueous matrices were in the range of 86 ± 0.3 to 103 ± 0.5 min. The addition of alperujo amendment to the soil produced an increase in the half-life from 62 ± 0.2 min (soil) to 75 ± 0.3 min (amended soil). In addition, a comparison to other organic amendments was also performed. Results showed that the presence of the organic amendment retarded the photodegradation in paddy soil and water. Regarding degradation products, the main process involved was the cleavage of the oxime moiety giving rise to the formation of the corresponding imine compound.

Keywords : by-products, herbicide, organic amendment, photodegradation, profoxydim

Conference Title : ICPC 2023 : International Conference on Pesticide Chemistry

Conference Location : Berlin, Germany

Conference Dates : May 11-12, 2023