

## Environmental Photodegradation of Tralkoxydim Herbicide and Its Formulation in Natural Waters

**Authors :** María José Patiño-Ropero, Manuel Alcamí, Al Mokhtar Lamsabhi, José Luis Alonso-Prados, Pilar Sandín-España

**Abstract :** Tralkoxydim, commercialized under different trade names, among them Splendor® (25% active ingredient), is a cyclohexanedione herbicide used in wheat and barley fields for the post-emergence control of annual winter grass weeds. Due to their physicochemical properties, herbicides belonging to this family are known to be susceptible to reaching natural waters, where different degradation pathways can take place. Photolysis represents one of the main routes of abiotic degradation of these herbicides in water. This transformation pathway can lead to the formation of unknown by-products, which could be more toxic and/or persistent than the active substances themselves. Therefore, there is a growing need to understand the science behind such dissipation routes, which is key to estimating the persistence of these compounds and ensuring the accurate assessment of environmental behavior. However, to our best knowledge, any information regarding the photochemical behavior of tralkoxydim under natural conditions in an aqueous environment has not been available till now in the literature. This work has focused on investigating the photochemical behavior of tralkoxydim herbicide and its commercial formulation (Splendor®) in the ultrapure, river and spring water using simulated solar radiation. Besides, the evolution of detected degradation products formed in the samples has been studied. A reversed-phase HPLC-DAD (high-performance liquid chromatography with diode array detector) method was developed to evaluate the kinetic evolution and to obtain the half-lives. In both cases, the degradation rates of active ingredient tralkoxydim in natural waters were lower than in ultrapure water following the order; river water < spring water < ultrapure water, and with first-order half-life values of 5.1 h, 2.7 h and 1.1 h, respectively. These findings indicate that the photolytical behavior of active ingredients is largely affected by the water composition, and these components can exert an internal filter effect. In addition, tralkoxydim herbicide and its formulation showed the same half-lives for each one of the types of water studied, showing that the presence of adjuvants in the commercial formulation has not any effect on the degradation rates of the active ingredient. HPLC-MS (high-performance liquid chromatography with mass spectrometry) experiments were performed to study the by-products deriving from the photodegradation of tralkoxydim in water. Accordingly, three compounds were tentatively identified. These results provide a better understanding of the tralkoxydim herbicide behavior in natural waters and its fate in the environment.

**Keywords :** by-products, natural waters, photodegradation, tralkoxydim herbicide

**Conference Title :** ICPC 2023 : International Conference on Pesticide Chemistry

**Conference Location :** Berlin, Germany

**Conference Dates :** May 11-12, 2023