**Effect of different cyclodextrins on herbicide photodegradation in soil solution.**

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**INTRODUCTION**

Cyclodextrins (CDs) are cyclic oligosaccharides which have received considerable attention due to their ability to include a wide variety of organic and inorganic guest molecules in their hydrophobic cavities.

In the field of environmental chemistry, CDs promote the degradations of certain organic pollutants through the enhancement of their solubility and, therefore, their desorption from soils.

On this basis, this work aims to obtain a laboratory-scale information on the effect of different CDs (β-CD, RAMEB, and HPBCD) on the photodegradation of the herbicide norflurazon (NFL) monitored in the presence of different soil components in water suspensions, in comparison with its photodegradation in the CD-less systems.

**MATERIALS AND METHODS**

- Herbicide Norflurazon (NFL): 20 mg/L.
- Cyclodextrins: 0.01 M.
  - β-Cyclodextrin (BCD)
  - 2-Hydroxypropyl-β-Cyclodextrin (HP)
  - Randomly-methylated-β-cyclodextrin (RM)
- Soil colloidal components: 80 mg/L.
  - Montmorillonite Swy-1 (M)
  - Synthetic fulvic acids (Fluka) (FA)
  - Natural metal-fulvic acid complex (HA)
  - Synthetic goethite (G)
- SUNTEST photoreactor, wavelengths >290 nm.
- Norflurazon was analysed by HPLC/DA.

**RESULTS AND DISCUSSION**

NFL photodegradation profiles in aqueous solution and in suspensions of different soil colloidal components: montmorillonite (M), goethite (G), natural fulvic acids (FA) and synthetic humic acids (HA).

In general, the presence of the different soil components in suspension provoked a reduction in NFL photodegradation rate, due to the screen effect of soil particles and probably to the adsorption of NFL on these colloidal components. In all cases the rate of photodecomposition followed a first-order kinetic.

The presence of cyclodextrins (CDs) in suspensions of soil colloidal components showed an increase of NFL photodegradation, due to the competition generated in these system between the sorption on their surfaces and the formation of inclusion complexes with the CDs. Less NFL molecules are adsorbed on the soil components, increasing their light exposure. Besides, the hydroxyl groups surrounding the CDs cavity can act as photosensitizers, facilitating the photodegradation of the herbicide when it is forming an inclusion complex.

**CONCLUSIONS**

The selected cyclodextrins showed an inductive photodegradation effect on the herbicide norflurazon, which could be mainly assigned to the inclusion effects of CDs to catalyze interactions between norflurazon and certain reactive radicals generated by the different colloidal components. This work reveals that the effect of the CDs on the herbicide enhanced solubilization, coupled to an increased photodegradation using CDs as photosensitizers, could be a promising method for pesticide-contaminated soil and water remediation.