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DEVELOPMENT AND VALIDATION OF UV SPECTROPHOTOMETRIC METHOD FOR DETERMINING THE HERBICIDE MOLINATE WITH AND WITHOUT ALGINATE MICROPARTICLES

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Abstract

Molinate (S-ethyl-azepane-1-carbothioate) is a thiocarbamate herbicide used in rice cultivation for the control of grass weeds. Environmental contamination with molinate is of major concern due to the adverse effects described both for humans and animals.

Molinate hydrolase, a novel amidohydrolase previously characterized, is responsible for the initial breakdown of molinate, cleaving the thioester bond of molinate, releasing ethanethiol and azepane-1-carboxylate (ACA). Biotechnology is the key for sustainable farming. With advances in biotechnology, bioremediation has become one of the most rapidly developing fields of environmental restoration. Through the microencapsulation of molinate hydrolase, we are aiming to develop a bioremediation process for the effective molinate degradation in rice paddies.

The purpose of this work was to develop and validate an UV method to effectively quantify the substrate (molinate) in further assays with free and microencapsulated molinate hydrolase. The analytical method was validated and the main parameters, as limit of detection, linearity range, precision and accuracy were determined, and compared to those obtained by HPLC (regarding free enzyme kinetics). Both methods show to be linear ($r > 0.999$) over the concentration range of 0.005-0.150 mM molinate. The global uncertainty, estimated accordingly to the bottom-up approach used by Eurachem, was estimated for both methods.

The UV analytical method is effective and seems that it can be applied in future for the quantification of molinate breakdown by free and encapsulated molinate hydrolase.

Key words: microparticles, molinate, molinate hydrolase, uncertainty, UV

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