

Constructing slow-release metribuzin formulations using co-extrusion of the pesticide and poly- ϵ -caprolactone

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Abstract.

A simple and low-cost method of obtaining slow-release pesticide formulations was proposed by co-extrusion of a pesticide with a low-melting biodegradable polymer, at a temperature above the melting points of both components. A herbicide metribuzin and low-melting polyester poly- ϵ -caprolactone were chosen for this work. Slow-release metribuzin formulations containing 10%, 20%, and 40% herbicide were prepared. Metribuzin release in water during 7 days of exposition reached 81% from the formulations with the 10% loading and 96% from the specimens with the 40% herbicide loading. Release kinetics of metribuzin best fitted the First-order model. Biodegradation and pesticide release of the polymer constructs with metribuzin were further studied in the model soil for 14 weeks. Degradation rates of the specimens increased with an increase in pesticide content: between 9% for the 10%-loaded specimen and 20% for the 40%-loaded specimen over 14 weeks. The release of metribuzin from the specimens with the 10-20% and 40% loadings reached 37-38% and 55%, respectively; thus, taking into account soil degradation of the herbicide, the herbicide content in soil reached 23-25% and 33%, respectively, of the amount initially loaded into the polymer matrix. So, the study showed that the used approach is promising to obtain formulations with long-term release for soil application.