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**An ionic liquid-based ultrasound assisted dispersive liquid-liquid  
microextraction procedure followed by HPLC for the  
determination of low concentration of phytocides in soil**

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**ABSTRACT**

A simple and efficient method known as the ionic liquid-based ultrasound-assisted dispersive liquid-liquid microextraction (IL-USA-DLLME) combined with high-performance liquid chromatography (HPLC) was successfully developed for the extraction and determination of three phytocides (imazethapyr, bensulfuron, and uniconazole) in soil samples. Several experimental parameters that influence extraction and determination, such as the type and volume of extraction solvent, the volume of disperser solvent, pH of solution, salt effect, ultrasound time, and the chromatographic conditions were investigated. Under optimal conditions, a linear relationship was observed in the range of 0.1000 -200.0 µg/mL with the correlation coefficients ( $r^2$ ) ranging from 0.9965 to 0.9990, and the limit of detections (LODs) ranged from 0.0500 to 0.3100 µg/mL for the three analytes. The relative standard deviations (RSD) at two spiking with different concentration levels of 6.600 µg/mL and 16.00 µg/mL varied from 0.9% to 2.4% (n=6), and recoveries were between 87.10-95.01%. On the basis of this, phytocides in two actual soil samples from a wheat field and a vegetable farm were analyzed. This work demonstrated that IL-USA-DLLME method with 1-Butyl-3-methylimidazolium bis(trifluoromethylsulfonyl) imide ([BMIM]TFSI) could be used to detect the trace amounts of phytocides in soils. This method has the advantage of high extraction efficiency, good sensitivity, simplicity and environmental friendliness.

**Key words** ionic liquid, dispersive liquid-liquid microextraction, high-performance liquid chromatography, phytocides, soil samples

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