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# Faster degradation of herbicidally-active enantiomer of imidazolinones in soils

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## ABSTRACT

Imidazolinones are chiral herbicides, comprised of two enantiomers with differential herbicidal activity. In this study, the selective degradation of enantiomers of the three imidazolinone herbicides, imazapyr, imazethapyr and imazaquin, was determined in a variety of soils selected to cover a broad range of physico- chemical characteristics. The R(+) enantiomer of all three herbicides, which has greater herbicidal activity (up to eight times), was found to degrade faster than the less active S(–) enantiomer. The enantiomer fraction (EF) was used as a descriptor of enantio-selectivity of the imidazolinone herbicides. The EF values increased with increasing incubation time for imidazolinones with a fast initial phase followed by a slower phase. While the enantio-selectivity was not significant in acidic soils ($pH_w$ 5.02 and 5.20), it was highly significant ($P < 0.001$) in alkaline soils ($pH_w$ 7.6, 8.2 and 8.7). Significant positive correlations of EF values of imazapyr ($P < 0.001$, $R^2 = 0.41$), imazethapyr ($P < 0.002$, $R^2 = 0.47$) and imazaquin ($P < 0.001$, $R^2 = 0.54$) were found with the soil $pH_w$ ranging from 5.02 to 8.7. However, no correlation of EF was found with other soil properties. In addition to showing enantioselective degradation of the three herbicides in the soils studied, the study highlighted that for imidazolinones the herbicidally more active enantiomer can be preferably degraded by microorganisms.