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Talbert R E & Fletchall O H. The adsorption of some *s*-triazines in soils. *Weeds* 13:46-52, 1965.
[Field Crops Dept., Missouri Agricultural Experiment Station, Univ. Missouri, Columbia, MO]

The relative adsorption of herbicides onto soil particles regulates biological activity and mobility of herbicides. The concept of adsorption coefficient (Kd) as determined by the use of ^{14}C-labeling was used to describe the adsorption of five *s*-triazine herbicides as influenced by various soil properties. [The *SCI*® indicates that this paper has been cited in over 110 publications, making it the most-cited article published in this journal.]

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Although the principles of pre-emergence herbicides had been elucidated earlier,[1] the development of triazines made possible the selective control of a much broader spectrum of weeds. Simazine, one of the family of triazines, was the first herbicide that controlled practically all weed species in corn for the entire growing season by a single application to the soil surface at the time of planting. O.H. Fletchall and I became excited about soil activity of *s*-triazines from our observations of field studies with simazine in 1956.[2]

By the time I started research on my PhD program in 1960, I had become familiar with the problems associated with the use of the crop-specific herbicides, simazine and atrazine on corn and propazine and atrazine on grain sorghum. Although the mode of action of these herbicides was still not understood, we recognized that it was important to apply the proper quantity of herbicide on a particular soil to achieve weed control and avoid damaging subsequential crops with carryover residues. It became apparent to us that the degree of herbicide adsorption might be a key to understanding herbicide activity in soils.

Ellis R. Graham, a soil chemist, taught me about using radioisotopes. After seriously contaminating the chamber of Graham's proportional planchet counter with ^{14}C-atrazine, I learned the advantage of liquid scintillation counting. The theory and techniques used to study sorption of ions by soils were adapted for the study of ^{14}C-triazine adsorption in soils. The results for a given adsorption system could be expressed as a Kd (the adsorption coefficient), which is the ratio of the amount of herbicide adsorbed onto the soil particles to the amount in the equilibrium aqueous solution. The effects of soil organic matter, clay content, temperature, and pH on adsorption could be shown with the technique described in our paper.

It is generally concluded that adsorption is the key phenomenon controlling the distribution of herbicides in soil.[3] It influences concentrations in the soil solution; thus, it is closely involved in the movement and bioavailability of herbicides in soils. Although not the first to apply adsorption theory to herbicides in soil, our work was the first to simplify the technique by the use of radioisotopes.

The reasons this paper has been cited so frequently are that (1) this technique has become a standard used in herbicide behavior studies in soils as affected by various soil properties and (2) the study involves the *s*-triazines, probably the most important group of herbicides in use during the 1960s, 1970s, and early 1980s.

1. **Anderson J C & Wolf D E.** Pre-emergence control of weeds in corn with 2, 4-D. *J. Amer. Soc. Agron.* 39:341-2, 1947.
2. **Fletchall O H.** Simazine (2-chloro-4,6-bis-ethanol-*s*-triazine) for weed control in corn. *North Central Weed Control Conf. Res. Rpt.* 13:91, 1956.
3. **Hance R J, ed.** *Interactions between herbicides and the soil.* New York: Academic Press, 1980. 349 p.

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