MOVEMENT AND PERSISTENCE OF CHLORSULFURON AND TRIASULFURON IN A SANDY SOIL OF WESTERN AUSTRALIA

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Abstract. In WA a total of about 2 million hectares is currently treated with chlorsulfuron (Glean®) and triasulfuron (Logran®). However, the performance of these herbicides is variable and little is known about factors that influence their movement, persistence and activity in the sandy soils used for wheat-lupin-pasture rotations.

In a 1989 field experiment at Watheroo, 250km north of Perth, chlorsulfuron and triasulfuron were applied to the surface of plots (1.5 x10m) at 30 and 40g a.i./ha for fallow plots, and half these rates for plots sown with wheat (*cv* Kulin). Application dates were 27 May and 24 June; at the latter date the herbicides were also applied to plots that had received powdered calcium carbonate that raised the pH of the surface 5cm from 4.7 to 6.7. Buried pots of herbicide-treated soil (15-20µg/kg soil) provided a treatment of degradation without leaching in a soil maintained near field capacity. These treatments were designed to test the effect of the soil water balance, temperature and pH on the movement and persistence of the herbicides. The soil profile was sampled to 17.5cm at six levels on 1, 14, 28, 56 and 100 days after herbicide application and buried pots were exhumed on the same days. Samples were assayed for residues with a lentil bioassay of saturated calcium hydroxide extracts of the soil. The water, radiation and temperature environments were recorded through the life of the experiment. Any damage to wheat (*cv*. Kulin) was assessed as reduction in shoot biomass at 56 days after sowing and in grain yield at maturity in herbicide-treated, hand-weeded plots. The level of weed control was also observed. The bioassay was able to detect residues of ≥ 1 µg/kg soil.

Both herbicides leached out of the surface 2.5cm of soil, but only in the calcium carbonate plots did we find them below 15cm, and these concentrations were near the limits of the bioassay sensitivity. Chlorsulfuron losses were greater than triasulfuron due mainly to a more rapid loss in the first fourteen days after application; these losses ranged from 38-56% for chlorsulfuron and 13-42 % for triasulfuron. During these first 14 days there were no leaching rains and the average maximum and minimum temperatures at 1.25cm were 20°C and 9°C respectively for both times of herbicide application. After 100 days the losses were 85-89% and 32-73% for chlorsulfuron and triasulfuron respectively; the smaller losses were from the high pH treatment. Leaching below the sampled profile was unlikely. However, a laboratory experiment established that the herbicides could redistribute upwards in the profile as water evaporated from the soil surface. Reductions in shoot biomass were not carried through to losses in grain yield. There were late germinations of capeweed (*Arctotheca calendula* Steinh.) and doublegee (*Emex australis* L.) and therefore slower rates of herbicide loss would have been beneficial.