

HERBICIDE MOVEMENT AND PERSISTENCE IN SANDY SOILS OF LUPIN/WHEAT
REGIONS IN WESTERN AUSTRALIA: TRIAZINES

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Abstract. Most of the lupins (*Lupinus angustifolius* L) grown in Western Australia are sown with simazine \pm atrazine for weed control but results are variable. Herbicide movement and persistence, and the influence of temperature, soil moisture and soil pH on these processes were measured in sandy soils at a high rainfall site (Shenton Park, 696 mm rainfall for May-September 1988) and a medium rainfall site (Watheroo, 158 mm rainfall for May-September 1989). Two environments were established by two different times of herbicide application at Shenton Park (pH 5.8), and three environments at Watheroo (pH 4.7) by two times of herbicide application and by application of lime (pH 6.7). The herbicides were applied at 1 kg a.i./ha and incorporated to 2-3 cm depth. Buried pots of herbicide-treated soil provided a treatment of degradation without leaching. The profile was sampled at 6 depths to 20 cm on 5 occasions from 1 to 100 days for herbicide residues and soil moisture; the weather and soil temperatures were measured also. Herbicide residues were extracted by methanol and measured by high performance liquid chromatography.

The herbicides leached below 15 cm only in the environment receiving the most rain (390 mm in 100 days) and in the limed plots. Averaged over all environments, 19% more atrazine was leached than simazine although adsorption of atrazine ($K_d = 1.6$ and 1.2 for Watheroo and Shenton Park soils) was greater than simazine ($K_d = 0.6$ and 0.8). After 100 days, 43-89 % of the residues remained in the top 5 cm where the roots of weed seedlings were concentrated and we observed sustained phytotoxicity. Persistence was similar for simazine and atrazine and for the different times of application, although temperature and soil moisture varied, but increased with soil pH. After 100 days, 27% of the applied herbicides remained at Watheroo (pH 4.7), 34% at Shenton Park (pH 5.8) and 42% at Watheroo (pH 6.7). The reaction kinetics were not first-order. In many environments both in the profile and buried pots, there was an initial rapid rate of degradation followed by a slower phase although mean temperatures were similar. The rate constants (1/d) for simazine in buried pots in the first environment at Watheroo were 0.020 for 1-14 d (mean temperature 14.0°C) and 0.007 for 14-100 d (mean temperature 14.2°C). Aspects of degradation kinetics are being investigated.