

SIMAZINE, ATRAZINE AND TRIASULFURON MOVED UPWARDS  
IN A SANDY SOIL AS WATER EVAPORATED

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*Abstract.* Persistence and leaching are the more usual concerns about herbicides in soil. Simazine was found in the surface of a Watheroo sandy loam after a farmer had buried it with pre-sowing cultivation; redistribution with capillary movement of water was implicated. Columns of a Watheroo loamy sand (10% water at field capacity) were prepared by placing the soil in PVC tubes that were 29cm long with a diameter of 8.5cm. The tubes were sub-irrigated by placing them in buckets of water with 16cm of the tube exposed above the water level. Tubes were either left in the buckets of water for sub-irrigation throughout the experiments, or the lower 16cm that was waterlogged by the sub-irrigation wetting pre-treatment was cut away and replaced with a 16cm length of tube with soil at field capacity. The tubes of soil were placed in a room where temperature was controlled at 13°C/19°C (12h/12h) with an irradiance during the high temperature cycle of 210W m<sup>-2</sup>. Evaporation was measured daily as changes in weights of the tubes. With sub-irrigation evaporation decreased from 3.4±0.2 mm/day to 2.5±0.4 mm/day over the six days of the experiment and from 2.1±0.4 to 0.6±0.1 mm/day without sub-irrigation. In the absence of sub-irrigation the soil in the tubes dried to 9cm from the surface. This was defined as the capillary zone. Herbicides were applied at 2cm below the soil surface by removing an annulus of soil, pipetting the herbicide upon the exposed surface, and then replacing the annulus of soil. Herbicides were applied in 1mL of water to give the equivalent rates of application of 88g/ha of atrazine and simazine and 44g/ha of triasulfuron. The herbicides were applied to the same tubes of soil since it was possible to extract and assay each of them in the presence of the others. The evaporation treatments were ± sub-irrigation and a control for each was a tube covered tightly with aluminium foil which prevented evaporation. There were four replicates of each treatment. Soil temperatures remained within 1°C of air temperature. After six days of ± evaporation the soil was pushed from the tubes and cut into layers to 9cm below the soil surface. Samples of soil from each layer were extracted with either methanol or saturated calcium hydroxide for the triazines and triasulfuron respectively. Residues in the extracts were assayed using high performance liquid chromatography for the triazines or a lentil bioassay for triasulfuron.

When evaporation was sustained for six days by sub-irrigation more than 50% of the three herbicides moved into the surface soil (0.0 to 0.8cm). When evaporation was not sustained by sub-irrigation there were no measurable amounts of the three herbicides in 0.0 to 0.8cm layer but 24%, 18% and 12% of the total in the soil at the end of six days was in the layer 0.8 to 1.6cm for atrazine, simazine and triasulfuron respectively. There were no movements of the herbicides into the top 1.6cm when evaporation was prevented by the cover of aluminium foil.