

AN INVESTIGATION OF THE RATE OF DETOXIFICATION AND
MOVEMENT OF PICLORAM IN A CLAY SOIL

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Picloram (4-amino-3,5,6 - trichloropicolinic acid), as picloram/2,4-D or picloram/MCPA, is applied for the control of specific weed problems in a number of crops on the Darling Downs.

Rate of loss of herbicidal activity of picloram under field conditions is variable and is dependent on soil and climatic factors. In view of the possible hazards of persistent residues to following sensitive crops and to the groundwater, a knowledge of the rate of breakdown and vertical movement of picloram residues in a black earth soil profile in this area is necessary.

Accordingly, a field trial was established on a black earth soil type near Warwick. The surface soil of the site analyzed 55% montmorillonitic clay, 1.8% organic C and pH 7.3.

Picloram was applied to field plots, which were separated by earthen banks, at rates of 0, 1/3, 1,3,9, and 27 oz per acre (0, 0.023, 0.07, 0.21, 0.63, and 1.89 kg per hectare) in October 1968. The trial is a randomized block design of four replicates. The plots were chisel ploughed 44 days after picloram application and the sampled portions of the plots have subsequently received normal cultural and cropping (wheat) treatment.

Soil samples for bioassay are obtained from three sites per plot and composited for individual depth levels. The sample of the profile is obtained as a clean core from a 2 in. (5.08 cm) power-driven tube.

The samples are bioassayed using soybeans var. Java as the test plant. Five plants are grown per 4 in. (10.16 cm) pot. A concentration series (range from 0.01 to 0.00025 ppm) is prepared for each depth level examined for each of the replicates.

For concentrations greater than 0.002 ppm the index of measurement has been the length of the unifoliate leaves. For concentrations of 0.002 ppm and less the more sensitive index of length of centre leaflet of first or second trifoliate leaf is used.

The limit of sensitivity for this soil type is 0.0005 ppm.

At the time of writing, the trial has been sampled for bioassay determination of residues at intervals of 113, 225 and 510 days subsequent to picloram application. Depth levels examined at the corresponding periods have been 6 ft (1.83 m), 4 ft (1.22 m) and 3 ft (0.91 m) respectively. Respective precipitations for

the period have been 10.98 in. (27.89 cm), 15.30 in. (36.86 cm) and 36.51 in. (92.74 cm).

RESULTS

(a) Movement in Profile

At all three sampling periods any remaining active residues have been concentrated in the surface 6 in. (15.2 cm) of soil. Active residues have occurred in the 6-12 in. (15.2 - 30.5 cm) zone but only at the highest two rates of application and at much lower concentrations than those present in the surface soil. Residues have not been detected below 12 in. (30.5 cm).

(b) Rate of Breakdown

The estimated percentages of applied picloram present as active residues in the soil at the three sampling periods are as tabulated:

Estimated Percentages of Applied
Picloram Remaining

| Rate applied (oz a.e.) | 113 days | 225 days | 510 days |
|---------------------------|----------|----------|----------|
| 1/3 | 15.0 | 10.0 | 0.0 |
| 1 | 6.1 | 8.1 | 0.0 |
| 3 | 16.1 | 8.0 | 1.1 |
| 9 | 16.5 | 12.5 | 2.0 |
| 27 | 19.5 | 23.9 | 9.7 |

The two apparent reversals in picloram activity are presumed unreal and could probably be attributed to an insufficient number of sampled sites per plot.

The initial rapid rate of loss of activity of picloram decreased over the subsequent sampling intervals.

Over the 113-510 days period, there was a marked decrease in the rate of inactivation of residues at the highest rate of application as compared with that of the lower rates.

On this soil type, under conditions of cropping, picloram residues are not leached rapidly through the soil profile. Also single low-dosage applications of picloram are unlikely to present long-term hazards to following sensitive crops.