Soil Distribution of Simazine, Diazinon and Bromide in Sandy Soil after Exposure to 1985-86 Winter Rain in Fresno County. Troiano, J. and C. Garretson. EH 88-02. 1988.

Abstract

Rainfall has been implicated in the movement of pesticides to ground water in the northern coastal county of Del Norte in California. However, the importance of rainfall in other agricultural areas is unknown. Rainfall in the Central Valley, an area where pesticide residues have also been detected in ground water, occurs mainly during the winter months. This study sought to identify the influence of winter rainfall on movement of two pesticides in sandy soil located in Fresno County.

The soil distributions of simazine, diazinon, and bromide were determined after exposure to winter rain in 0.15 m increments of soil down to the 3.05 m depth. The herbicidal action of simazine inhibited growth of vegetation on that plot but dense weed growth was prevalent on the diazinon-treated plot. Bromide was also applied to each plot because it had historically been used to trace water movement through soil. Pesticide was applied on 11/22/85 and soil cores were taken on 5/6/86, 164 days after pesticide application. During that period, rainfall was recorded on 37 days and it totaled 25.2 centimeters (cm) with approximately 805 of the events below 1.0 cm in volume.

No diazinon was recovered from the cores. This probably resulted from its short soil half-life which ranges from 7 to 32 days. Simazine, on the other hand, was recovered down to the I.906 meter (m) mean segment depth but according to mass balance calculations, 69% of the residue was recovered in the surface 0.15 m sample. A small peak in simazine soil distribution was observed between the 0.737 and 1.392 m mean segment depths. The amount of simazine recovered from the cores corresponded to a soil half-life of 56 days which was very close to reported field dissipation values. Thus, the dissipation of simazine could have been attributed to microbial and chemical degradation processes.

The soil distribution of bromide, the water tracer, differed greatly from the simazine distribution. Most of the bromide was recovered in a peak between the 1.245 and 2.108 m mean segment depths which was deeper than the location of the peak measured for simazine. The bromide distribution also differed between the pesticide treatments. In the simazine-treated plot, very little bromide was detected in the surface 0.15 m segment and then it was not detected until the O.889 m mean segment depth. In contrast, the bromide peak in the diazinon-treated plot was located in the first 0.15 m surface soil segment with a smaller amount recovered between the 1.245 and 2.108 m mean segment depths. Apparently, the presence of the weed vegetation affected the soil distribution of bromide by physically removing bromide from the soil into plant tissues and/or by affecting the soil distribution of water through transpiration.

The total cumulative amount of winter rainfall (25.2 cm) was enough to solubilize all of the applied simazine. But many events were 1.0 cm and below in volume which would have limited the depth of water penetration between events. Also, simazine’s water solubility value is around 5 ppm so a single 1 cm rainfall event would be able to solubilize only 0.5 kg/ha or 11 % of the applied amount of simazine. Hence, in most events only a small amount of simazine would be available for movement as a solute. The pattern of bromide tracer indicated that water was available for deep movement which may have been mainly due to the few larger volume rain events. Penetration of simazine residues below the first

0.15 m soil segment may also have been solely due to those few larger volume rainfall events. The retardation in movement noted in the simazine distribution when compared to the bromide distribution may, in part, have been due to soil adsorption differences.

This study indicated pesticide and soil properties that may mitigate pesticide movement in areas of low rainfall and sandy soils.

1. The results with diazinon indicated that pesticides with short soil-half lives will be rapidly degraded if kept near the surface and hence unavailable for movement.
2. The results with simazine indicated that in areas of low rainfall the water solubility of a pesticide will determine potential for movement from the surface sites. Soil adsorption properties may affect the shape of the pesticide soil distribution curve relative to that observed for water.
3. The results for the bromide tracer indicated that the presence of vegetation restricted the movement of the tracer. Thus, movement of pesticides could also be greatly modified by the presence of vegetation.