

ABSTRACT OF THE THESIS

Diazinon and Carbaryl: Effects on the  
Soil Biota of a Soybean Ecosystem

by SIDNEY DRAGGAN, Ph.D.

Thesis director: Professor Paul G. Pearson

Replicate hectares at Hutcheson Memorial Forest, East Millstone, New Jersey, were drilled with soybean (Glycine max). Prior to planting, one plot in each hectare was treated with diazinon (4 pounds per acre) as a soil treatment. When plants reached a height of one foot, a second plot in each hectare was treated with carbaryl (one pound per acre) as a foliar spray. Corresponding control plots were established for each hectare.

The objective of this research was the determination of insecticide effect on organisms involved in decomposition and mineralization in the soil. Areas of investigation included: (1) dilution plate counts of soil bacteria, fungi, and protozoa; (2) characterization of cellulose decomposer activity; (3) observation of the rate of disappearance of confined leaf litter; (4) estimation of primary production of the native vegetation by the harvest method; and (5) determination of the density of soil micro-invertebrates.

Functional measures of cellulose decomposers during 1970 demonstrated a significant insecticide effect attributable to decreased decomposition of cellulose in the

carbaryl-treated plot of hectare 1 and increased decomposition in the diazinon plot of hectare 2. General trends were noted wherein numbers of soil microorganisms and levels of decomposition were higher within hectare 2.

Four plant species were noted to be affected by diazinon soil treatment. A stimulatory effect was noted for the biomasses of Raphanus raphanistrum, Agropyron repens, and Ambrosia artemisiifolia; while inhibition of growth was noted for Convolvulus sepium.

Soil micro-invertebrates demonstrated limited insecticide effects indicative of the nonpersistence of the insecticides utilized and the influence of environmental conditions. Large numbers of Homoptera from cores taken within carbaryl-treated plots were most probably attributable to individuals initially resident in those plots rather than an effect of carbaryl insecticide. Instances of possible population resurgence following application of the insecticides were noted for Oribatid mites and Hemiptera extracted from litter bags.

In conclusion, at low dosage levels, environmental conditions were noted to overshadow the acute impact of the insecticides diazinon and carbaryl and their subsequent effects on the soil biota. The differential insecticide effects noted in the relatively adjacent treatment plots makes the replication of insecticide treatments mandatory in studies aimed at the elucidation of insecticide effects on the biota of the soil ecosystem.