

Table 4. Organophosphate Pesticides Recovered in Clippings and Present in Percolate Water from a Sand Green in Florida

Pesticide	Dates applied	Total recovery (% of that applied) in	
		Clippings	Percolate
Fenamiphos (Nemacur)	13 Nov 91	-	0.06
	27 Jan 92	0.38	0.04
Metabolite of fenamiphos	13 Nov 91	-	17.69*
	27 Jan 92	0.14*	1.10*
Fonophos (Dyfonate)	13 Nov 91	-	<0.01
	27 Jan 92	1.17	0.02
Chlorpyrifos (Dursban)	27 Jan 92	7.87	0.15
	21 Apr 92	0.52	0.08
Isazophos (Truimph)	21 Apr 92	0.43	0.09
	15 Sep 92	0.38	0.02
Isofenphos (Oftanol)	21 Apr 92	0.79	0.02
	15 Sep 92	0.89	0.01
Ethoprop (Mocap)	15 Sep 92	0.44	0.05

* Metabolites expressed as % of parent compound applied. From Snyder and Cisar 1995

A study of Table 1 shows that leachability is a balance between water solubility, adsorption on soil colloids (K_{oc}), and the half-life of a pesticide in the soil (DT_{50}). Half-life is estimated on a compound's tendency to be immobilized and degraded by microorganisms. Thus some very soluble compounds may leach little if they have a high K_{oc} or a short DT_{50} . For example, the fungicide propamocarb (Banol) is highly water soluble but also has a very high affinity for organic soil colloids ($K_{oc} = 1,000,000$) and a relatively short half-life in soil ($DT_{50} = 30$ days) which gives it a negative GUS value and an SCS leaching potential ranking of "small."

Pesticide leaching from turf has been measured in field studies. Snyder and Cisar (1995) compared leachability of several pesticides through a sand green in Florida (Table 4). This system is prone to high water infiltration rates, so pesticide leaching would be expected. However, of the six

pesticides studied, none leached more than 0.2% of the material applied. Only the metabolite of fenamiphos (Nemacur), which retains the toxicity of its parent material, but is more water soluble, leached almost 20% of equivalent nematicide applied during mid-November. Nemacur leaching is a water quality concern when it is applied to sandy soils. It is apparent that even a highly permeable turf system will leach little pesticide due to organic matter binding and rapid degradation by microorganisms. Only about 1% of applied pesticide was recovered in clippings. Most of it was retained in thatch, where it was rapidly metabolized.

Soil type will influence pesticide leaching, as was demonstrated in a study reported by Dr. Martin Petrovic at Cornell University (1995). He measured leaching of pesticides from Penncross

Terms to Know

Absorption - the process by which a chemical is transported into a plant cell or the matrix of a soil colloid. **Adsorption** - the process by which a chemical binds to plant or soil particle surfaces. **Sorption** - collective reference to both absorption and adsorption. **Desorption** - the release of previously absorbed or adsorbed materials.

Colloid - a particle of small size ($< 2 \mu$ diameter) that remains suspended in water - will not settle out. Soil colloids contain electrical charges and have chemically active surfaces.

Degradation - breakdown (biological or chemical) of a chemical into simpler compounds or elemental components.

Half-life - time required for half the quantity of a compound to degrade.

Leaching - movement through the soil profile of a chemical carried by water. **Leachate** - the chemical transported in this process.

Metabolism - processes by which a chemical is changed (into tissue, energy, and waste) through the action of living organisms.

Percolation - movement of water through a soil profile.

Vapor Pressure - a measure of the tendency of a solid or liquid to volatilize or evaporate.

Volatilization - process by which a solid or liquid changes to its gaseous state.