Integrated Pest Management

Biobeds for Pesticide Solution Disposal

Disposing of pesticides is always a problem at nurseries. Filling and rinsing spray equipment results in a large quantity of pesticide solution that must be contained and treated. No matter how much care is taken, there are still instances when pesticides are spilled, leaked or washed off the equipment, possibly contaminating surface or ground water. Pesticides can persist in the soil for long periods of time and, because filling and rinsing sprayers is usually done at the same location, these sites soon become potential hazards.

Agrochemical collection facilities have been proposed to prevent the potential soil and groundwater contamination associated with improper handling of pesticides. However, because they can cost from $8,500 to $40,000, these facilities would be cost prohibitive to many small nurseries. Besides, engineered facilities merely collect and contain pesticide solutions which will have to pumped and transported for disposal at a treatment facility.

Biobeds can be a simple and affordable solution to this problem. Originally developed in Sweden, these innovative structures have been shown to be very effective in collecting, retaining, and degrading pesticides. Biobeds are in-ground collection and treatment pits that contain pesticide solutions and break them down through microbiological activity. In their simplest design, a rectangular trench is excavated and filled with layers of topsoil and readily available organic amendments such as peat and straw (Figure IA). The trench contains vertical columns to support tractors and other pesticide application equipment so that pesticide solutions can be directly drained into the biobed (Figure 1 B). Biobeds have been traditionally lined with a clay seal to prevent leakage but a plastic liner would work even better. A cap of grass is grown on the surface of the bed to remove moisture and prevent surface erosion.

The beauty of the biobed concept is that organic layers hold pesticide solutions and prevent leaching while they are microbially degraded. The topsoil layer should be rich in humus and low in clay to encourage pesticide-degrading microorganisms and provide binding capacity. Peat provides additional binding capacity and retains moisture. The straw layer is the primary site where most of the degradation of pesticides takes place because it is a substrate for microorganisms which breakdown a broad spectrum of chemicals.

The US Environmental Protection Agency recently contracted to have the biobed concept scientifically evaluated. The results have not been formally published but the initial results show that the chemical half-life of pesticides can be significantly reduced with biobeds. Despite the fact that high concentrations (1,000 ppm) were initially applied, four agricultural herbicides were rapidly degraded (Table 1). The microbes in the corn wastes used in this trial were apparently very effective in degrading atrazine, which is known to be particularly persistent in ordinary field soil. These results suggest that biobeds could be custom designed to treat specific pesticides by selecting different organic amendments. Another exciting possibility is that modified biobeds could be used to treat pesticide-contaminated soils.

The biobed concept is still relatively new but it has definite application to forest and conservation nurseries. We're not aware of any nurseries currently using this technology but hopefully it will be operationally tested in the near future.

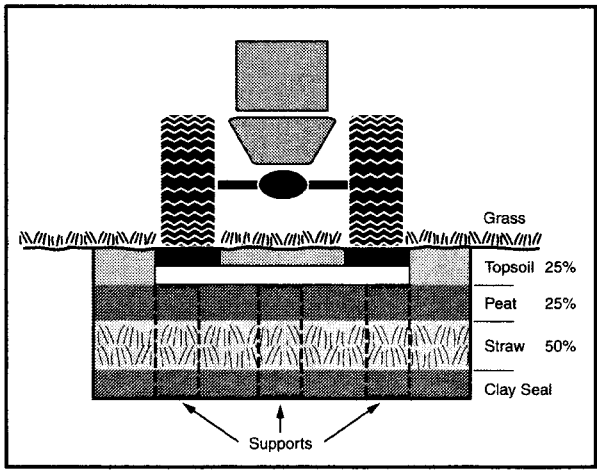

Figure 1 A

Figure 1B

Table 1:Degradation of pesticides within a biobed containing a mixture of 25% topsoil and 25% peat moss plus organic amendments

	Atrazine	Acetochlor	Alachlor	Metolachlor
	Chemical half-life days			
50 % Barley straw	2.2	5.5	27.3	29.6
50% Corn stovers	____	4.8	14.9	____
50% Corn cobs	0.62	____	____	27.8
Control (Field soils)	15 to 265	5 to 8	4 to 77	9 to 71

Source: Lamar (2001)

Sources:

Lamar, R.T. 2001. Final Report: Biobeds for containment and destruction of pesticides at agricultural mixing and loading facilities. Earthfax Development Corporation, U.S. Environmental Protection Agency Grant #68D00236. <URL:http://es.epa.gov/ncer/final/sbir/00/pollution/lamar.html> U.S. Environmental Protection Agency, Office of Research and Development, National Center for Environmental Research, Science to Achieve Results (STAR) Program.

Torstensson, L.; de Pilar Castillo, M. 1997. Use of biobeds in Sweden to minimize environmental spillages from agricultural spraying equipment. Pesticide Outlook (June 1997): 24-27.