# Pesticide Residue Management©

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During 2008, I was invited to attend a Pesticide Risk Reduction seminar in Sweden along with delegates from fifteen other countries. I would like to share some of the "food for thought" which was given to me during this initiative.

Pesticides and their residues result in risks to operators, workers, consumers, and the environment. Residues are found on plant material, in the air, water, and soil, and as growers in a green industry, it is very much in our power to limit these potential impacts.

Pesticide residues on plants can endanger the health of workers and consumers. In the case of ornamental crops (not intended for eating) withholding periods are often not considered important. Re-entry periods specified on pesticide labels are, however of paramount importance. Pesticide residues can accumulate in the human body, later resulting in diseases such as cancer which is difficult or impossible to trace back to chemical exposure. Concern for our workers and consumers should result in a strong awareness of re-entry periods as well as affect our pesticide choices. Toxicity, the persistence of residues, and the ability of the human body to metabolize these are of importance. United Nations Environmental Program (UNEP) has developed a "resource tool" which is downloadable and free at: <http://www.chem.unep.ch/Pesticides/PesticideResourceTool/default.htm>.

Pesticide residues are found in the air owing to volatilization and drift. Drift can be contained by making use of correct nozzle choices for the chemical to be applied as well as by avoiding spraying in windy conditions. When in Sweden, our group tested drift by making use of a knapsack sprayer with different nozzles and water-sensitive paper. Even in an enclosed space where there was little or no air movement, fine droplets were able to travel for a surprisingly long distance. As soon as a fan was turned on to emulate a light breeze, many fine droplets were found on the water-sensitive paper placed 5 m away. Course droplets drift less, but don't cover as well (there are bigger spaces between droplets). Finer droplets cover better, but drift more. Efficacy is important: if the biocide doesn't work, a repeat application (with attendant risks and costs) becomes necessary. Droplet size is therefore a trade-off between efficacy (as much as possible) and drift (as little as possible).

One of the most worrying aspects of pesticide residues and waste is that much of it ends in water bodies owing to leaching into ground water and runoff. In time, this can build up to considerable levels aggravated by evaporation. Water is life. We need to be careful about the pollution of water bodies. We may think that our contribution to this is negligible, but many small contributions to pollution can result in a big problem.

Pesticide residues can also build up in soil, leaching into ground water. Biologically active soil is able to break down small quantities of pesticide, but concentrated spills are too much for soil-living organisms to deal with.

As an industry, we are responsible for the generation of various kinds of pesticide waste including pesticide rinse water from containers and equipment, spills during mixing (nearly impossible to avoid), and excess spray mixture which has to be

disposed of. We need to be aware of what is happening to this waste and take steps to limit its impact.

The University of Sweden (SLU) has developed a simple and cost-effective method of dealing with rinse water and mixing spills known as a "biobed."

It was discovered that lignin degrading fungi have the ability to break down pesticide residues very effectively. These are often seen in hay bales as a type of white mould, often found towards the center of the bale. Lignin degrading fungi are also present in all biologically active soils.

A biobed is simple and cheap to construct. It consists of a hole 50 cm deep, either lined with plastic or with clay and filled with a mixture of straw, peat, and soil (2 : 1 : 1, by vol.). When trailed equipment is used, compaction (which would reduce the aeration and biological activity in the biobed) is avoided by constructing a ramp on which the equipment stands during rinsing and mixing. Grass is planted on the surface of the biobed to retain necessary moisture and to moderate temperatures thereby promoting biological activity. A biobed lasts for varying periods, but can generally be used for up to 3 years. Thereafter the contents are removed and composted and a new filling is placed in the biobed.

The graph (Swedish University of Agricultural Sciences) shows the level of decomposition of various active ingredients after a period of 1 year.

Biobeds are widely used in Europe, and some of them are very complex systems. There are fewer in the developing world and are often much simpler and smaller owing to the use of small equipment, but no less effective. Many of my co-delegates were involved in the construction of biobeds in their home countries, and one (from Columbia) ensured that this topic would be included in the agricultural syllabus at her university.

At New Plant Nursery, we constructed a simple, lined biobed. Waste water from the pesticide store is plumbed into the bed, and it is used for mixing and rinsing.

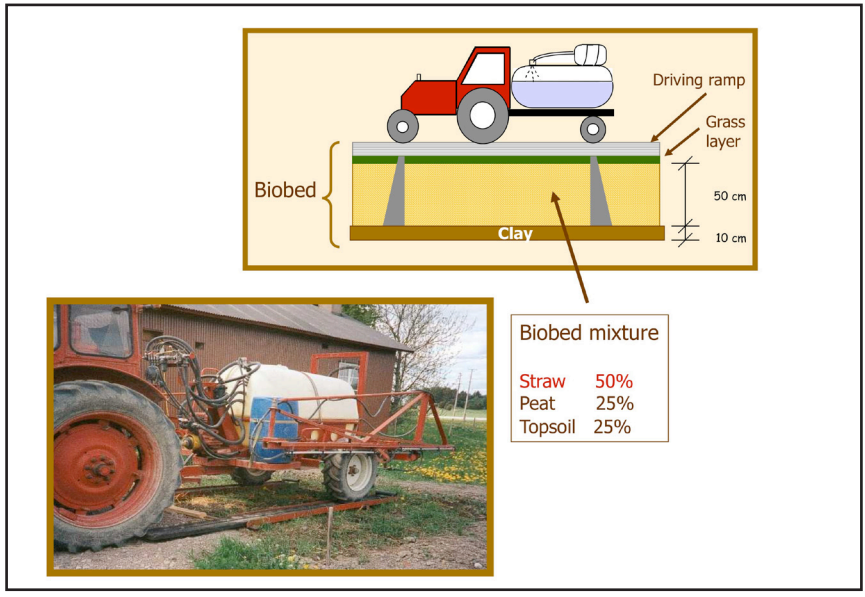


**Figure 1.** Biobed developed by University of Sweden (Castillo and Torstensson, 2008).

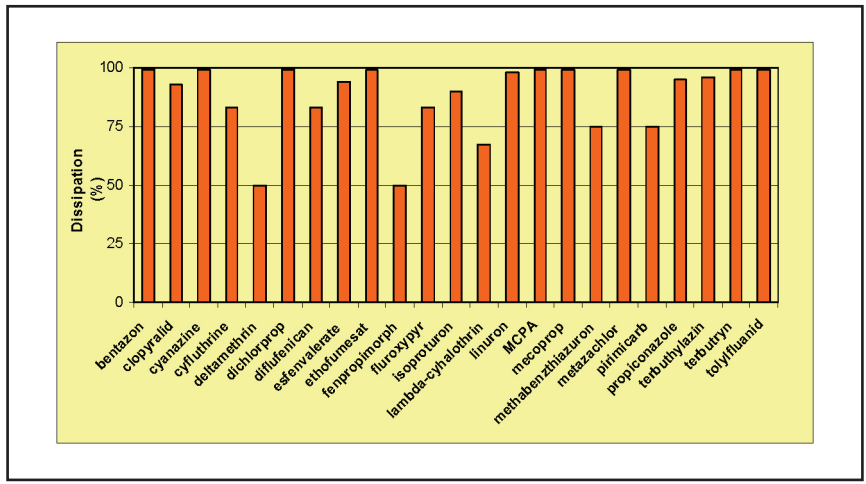


**Figure 2.** Level of decomposition of various active ingredients after a period of years (Castillo and Torstensson, 2008).

Excess spray mixture should not be emptied into a biobed, as it will limit the lifespan of the bed. It should be sprayed out on the crop or on fallow, biologically active (covered with growing plant material) land. An alternative to the biobed is to collect all rinse water in a tank, and then spray it out onto fallow ground. This is a more costly alternative.

In conclusion: the following should be borne in mind:

- Training: informed pesticide operators and workers.
- Personal protection: more than just mask and gloves.
- Pesticide storage: According to global Good Agricultural Pracitice (GAP).
- Pesticide choice: the least toxic alternative, the type of residue.
- Application frequency: only when needed! Cover spraying is expensive and bad for the environment.
- Methods: Coverage, weather conditions.
- Equipment: calibration, nozzles, good working order.
- Empty containers: do you know where they go? Triple rinse. Disposal.
- Liquid waste: biobed or collection of.

## BIOBEDS LINK:

<http://www.mikrob.slu.se/ShowPage.cfm?OrgenhetSida_ID=7296>.

**Acknowledgements.** María Del Pilar Castillo, Department of Microbiology, Swedish University of Agricultural Sciences, 7025, SE-750 07, Uppsala, Sweden, for supplying Figures 1 and 2.

## LITERATURE CITED

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