

## **Diazinon residues in soil following surface disposal of spent dip wash.**

Garry Levot<sup>1</sup> and Roger Lund<sup>2</sup>

<sup>1</sup>Elizabeth Macarthur Agricultural Institute, NSW Agriculture, PMB 8, Camden, NSW, 2570

<sup>2</sup>Agricultural Research Centre, NSW Agriculture, PMB 19, Trangie, NSW, 2823

Email: [garry.levot@agric.nsw.gov.au](mailto:garry.levot@agric.nsw.gov.au)

### **Summary**

*Currently producers do not make any special arrangements for the disposal of spent dip wash at the end of dipping. Similarly, mobile plunge dippers currently have no easy means of either transporting or disposing of spent dip wash. It is thought that simply pouring the solution onto the ground without some form of containment is likely to be unacceptable to environmental bodies or to the community at large. We measured diazinon residues in soil following disposal of 4000 L of spent dip wash containing approximately 70 mg diazinon/L and a much lesser volume of sludge from the bottom of a mobile plunge dip containing 320 mg diazinon/L. Residues in soil across a 450 m<sup>2</sup> disposal site were less than 10 mg/kg at 7 days after application.*

### **Keywords**

Diazinon, sheep dip, disposal, soil residues

### **Introduction**

Although there is a marked trend towards the use of pour-on or other low volume treatments for lice control, the use of full immersion plunge dipping or shower dipping is still common and is often recommended as an alternative to pour-ons if insecticide resistance is suspected. Many woolgrowers use the services of contract 'mobile plunge dippers' to treat or protect sheep for/from lice infestations. Although dedicated dip sumps may be left full at the completion of dipping there will be a need in most cases to 'clean out' sumps at various intervals during dipping to avoid excessive fouling of the insecticide solution. Current recommendation is that this should occur when 1 sheep per 2 L of dip volume have been treated. Mobile plunge dips, by their nature, must be emptied before being moved off-site. It is not unusual for in excess of 4000 L of spent dip wash to be pumped out or allowed to drain from these dips at the end of dipping. Generally, there is little or no preparation for this and the solution finds its own way and runs away along natural drains until it is absorbed into the soil. Opportunity exists for run-off to enter creeks, dams and grazing areas especially if rain or leaching occurs.

It is difficult to obtain clear recommendations for the proper disposal of dip solution. Labels generally stipulate that dip wash must not be discharged into streams and that rinsate from empty chemical drums should be added to the spray tank or disposed in a "disposal pit away from desirable plants and their roots, and watercourses". Workcover recommend that diluted pesticide (use rate), spray tank waste or other rinsate waste can be buried "*in a pit drain at least 1 metre below the surface... constructed along the contour of the land and be of sufficient length to accommodate the waste water. The disposal site should be sited to avoid seepage and run off which may contaminate other areas, and be remote, flood free, clearly marked and fenced; be in an area where there is no danger of contaminating dwellings, underground water, surface water, crops or livestock; be level, with a suitable plastic liner and have hydrated lime spread across the bottom; be suitably identified for a future owner or user of the property*" (Workcover, 1998). The Commonwealth Environment Protection Agency (CEPA) has no specific recommendation for dip disposal other than to use "*a disposal pit specifically marked and set up for this purpose clear of waterways, vegetation and roots*" (Holland, unpublished correspondence with NRA). In the United Kingdom new regulations were introduced in 1999 to protect ground water from pollution by toxic chemicals including used sheep dips. Disposal of a maximum of 5000 L of spent dip wash per hectare onto '*suitable land*' was permitted. By description, suitable land should be away from watercourses, be fairly flat with free draining soil and would not be flooded for at least one month after application. Stock were to be excluded for at least a month. If no suitable land was available the spent dip was to be stored for collection and proper disposal by a licensed contractor (NFU, 1995).

In Australia, the National Registration Authority in its review of existing chemicals program has issued a draft recommendation that spent diazinon dip wash should be limed to a pH>10 and then sprayed onto a paddock away from watercourses etc. Concern has been raised that it may not be possible to attain a pH of 10 and that if it were possible the solution would be phytotoxic. Moreover, this draft recommendation is unlikely to satisfy future Environment Protection Agency (EPA) requirements (Watson, *pers. comm.*).

In anticipation that some regulation of disposal of spent dip wash will be developed we undertook a soil residue trial to monitor the degradation of diazinon from spent sheep dip poured onto the soil. It is hoped that if current practice is shown to have no environmentally harmful implications this project's results will support a case for minimal additional requirements for dip disposal. However, if degradation is slow, these results will be the basis of a further project to determine an environmentally acceptable disposal practice for spent sheep dip that will satisfy EPA.

## Methods

A field trial was conducted in co-operation with Mr Phillip King, Dipping Contractor, Yeoval, on a commercial property belonging to one of his clients (Mr. Robert Lee, 'Coorah', Cumnock). Prior to the arrival of Mr King, an area (30 x 15 m) on a slightly sloping piece of land adjacent to the dip site was marked out and a soil bund created on the 'downhill' sides using a bobcat. Six sites across the site were marked with numbered pegs as soil sampling sites. An extra site in the lowest corner of the site was also included. Prior to dip disposal duplicate core soil samples (5 cm diam. x 8 cm deep) were taken from the 6 sites and placed into labelled ethanol rinsed jars and frozen as soon as possible prior to dispatch to NSW Agriculture's Analytical Chemistry Laboratories at Wollongbar for analysis.

The mobile plunge dip was set up, calibrated and operated by Mr King's staff according to his usual routine after being 'charged' with diazinon at 200 mg/L. The dip was operated along 'constant replenishment' principles with replenishment from an adjacent 1000 L supply tank. A total of 3113 sheep were dipped over 2 days.

At the completion of dipping approximately 4000 L of spent dip wash remained. A sample of this solution and a sample of the sludge from the bottom of the dip was collected and stored in labelled ethanol rinsed jars and dispatched to NSW Agriculture's Analytical Chemistry Laboratories at Wollongbar for analysis. The spent dip wash and sludge were spread as evenly as possible onto the ground in the designated area. The area was signposted and stock were excluded.

Beginning 1 day after disposal and then at days 7, 14, 28 and 56 after disposal, duplicate soil samples were collected from the 6 sampling sites and the boggy corner and stored as before. At day 56 only, duplicate samples were taken outside the bund adjacent to the boggy corner to determine whether there had been any movement of diazinon beyond the soil wall. Analyses were conducted by NSW Agriculture Chemists at Wollongbar by standard methodology.

## Results

Mean pre-disposal diazinon residue in the soil was less than 0.1 mg/kg. The concentration of the spent dip wash was 70 mg/L and the sludge contained 320 mg/kg.

One day after disposal the mean diazinon residue in the soil across the six marked sites was  $3.0 \pm 2.5$  mg/kg (range 0.1-8.2 mg/kg). By 14 days after disposal the mean residue was  $0.7 \pm 0.7$  mg/kg and at 56 days was  $0.1 \pm 0.1$  mg/kg. Diazinon residues in the samples taken from the boggy corner increased until at least 14 days after disposal, peaking at a mean of  $5.2 \pm 1.7$  mg/kg. At 56 days the mean residue at this site was  $0.7 \pm 0.3$  mg/kg. Samples taken outside the bunded area at day 56 contained no detectable diazinon.

## Discussion

Our results indicate that the diazinon concentration in spent dip wash and in the dip sludge particularly, is considerable. On-site disposal needs to be conducted in a responsible and environmentally acceptable manner. Intuitively, it seems advantageous to contain the excess spent dip wash within an area from which stock and people can be excluded. We have demonstrated that this is easily attained on relatively flat or slightly sloping terrain. The area sampled had been used 6 months previously for diazinon dip wash disposal (Phillip King, *pers. comm.*) and yet residues were uniformly less than the level of detection (0.1 mg/kg). Residues in the soil 1 day after disposal varied due to the unavoidable unevenness of disposal but were generally low (<9 mg/kg). Results for later sampling times indicated that diazinon degradation was relatively rapid with, on average, less than 1 mg/kg remaining across the site from day 14.

It is likely that seepage and/or surface movement of water into the boggy corner led to an increase in residues at that site between days 1 and 14 after disposal. Nevertheless, by 28 days after disposal mean residues were less than those recorded at day 14 and continued to decline to below 1 mg/kg at 56 days. These results suggest that diazinon degradation following disposal of spent sheep dip at a rate of about 8.9 L/m<sup>2</sup> onto clay loam was quite rapid. It is likely that nothing more than containment of the spent dip wash in a dedicated site may be required for the responsible on-site disposal of sheep dips.

## References

NFU (1995). Sheep dips - health and safety law. NFU Professional Services Department UK.

WorkCover (1998). Code of practice for the safe use and storage of chemicals (including pesticides and herbicides) in agriculture. WorkCover Authority of NSW, Catalogue item # 422, Sydney.