Case study – First 20 days after herbicide application is critical for runoff water quality

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Summary

The purpose of the current Mackay Whitsunday project is to demonstrate management practices which have the potential to reduce the amount of herbicides, nutrients and sediments leaving sugarcane farms and entering the Great Barrier Reef lagoon. Targeting nutrient and herbicide application rates to suit crop and paddock requirements should improve water quality. Lower rates and improved timing and management of these applications should yield further improvements.

Two monitoring sites have been established in the Sandy Creek catchment, south-west of Mackay. The treatments within each site employ different soil, nutrient and herbicide management practices. Rainfall, runoff, water quality, and farm operations were closely monitored over the 2010/11 wet season. This case study outlines herbicide results from one treatment at the Victoria Plains site (uniform clay soil).

The selected treatment (1.5 metre row spacing) was harvested on 3rd September 2010, and the cane trash remained on the soil surface. The herbicide Velpar K4 (diuron and hexazinone) was applied as a blanket application to the cane trash on 13th September 2010 at 3.8 kg/ha. Samples of cane trash were collected 0.3-100 days after herbicide application, and analysed for herbicide concentrations.

Over 30 runoff events were monitored during the 2010/11 wet season. Runoff from the treatment (runoff plot area ~1300 m^2) was measured through a flume, and samples collected automatically and analysed for herbicide concentrations.

Results

Key statement: The 20-day period after herbicide application is critical in reducing herbicide losses in runoff. **Infiltrating rainfall (or irrigation) during this period will assist in reducing the amount of herbicides lost to runoff.**

A total of 3300 mm of rainfall was recorded between 1st September 2010 and 30th April 2011, well above the estimated long-term average of 1468 mm. This resulted in 1751 mm runoff, with the first runoff event occurring seven days after herbicide application (there was no rainfall recorded during this period prior to the event that caused runoff). Peak concentrations of diuron and hexazinone were detected at the first cane trash sampling after application, and rapidly declined within 10 days of application (Figure 1). This decline would be due to both decay of the pesticides, and rainfall (143 mm) washing the pesticides off the cane trash and into the surface soil (and some lost in runoff). The calculated half-lives of diuron and hexazinone on the cane trash blanket were 11 and 9 days, respectively.

Diuron and hexazinone were detected in relatively high concentrations in the first runoff event (Figure 1), which was seven days after application. Concentrations then rapidly declined (calculated runoff-available half-life was 11 days for both diuron and hexazinone). By mid-October (within one month of herbicide application), ~92% of

the total runoff loss of these herbicides had occurred for the wet season, although only 6% of the season's runoff had occurred (Figure 2).

As the wet season progressed, more of the herbicide would have moved from the cane trash blanket into the surface soil, making it less available for runoff. Infiltrating rainfall events prior to runoff will also move the herbicide into the surface soil, as was experienced in the 2009/10 wet season when runoff herbicide concentrations (maximum concentrations of 18 and 41 µg/L for diuron and hexazinone, respectively) were much lower than in 2010/11.

Farmers can reduce potential residual herbicide losses by using overhead irrigation after spraying (on bare soil, wait at least two days after herbicide application before watering and ensure no runoff occurs). Don't apply herbicides to water logged soil or if runoff-causing rainfall is predicted within 48 hours of the planned application.

During the 2011/12 wet season, monitoring has continued. Much lower herbicide concentrations are expected this season, as more than 100 days passed between application and the first runoff event.

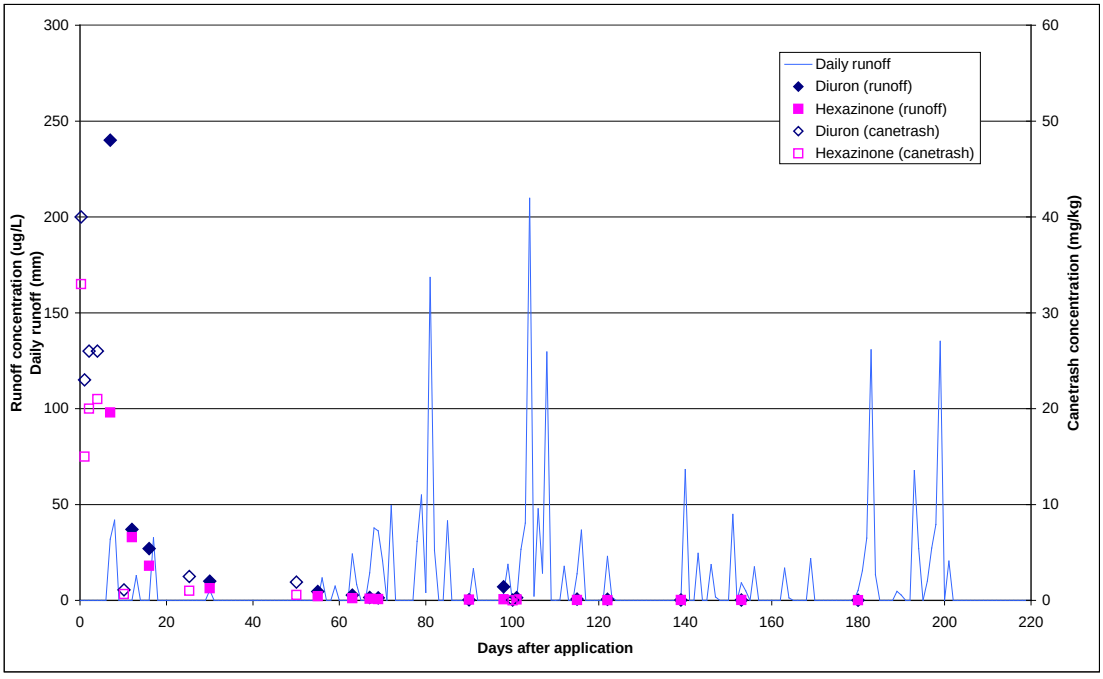

Figure 1 Daily runoff during the 2010/11 wet season, and measured concentrations of herbicides on cane trash and in runoff, Victoria Plains site

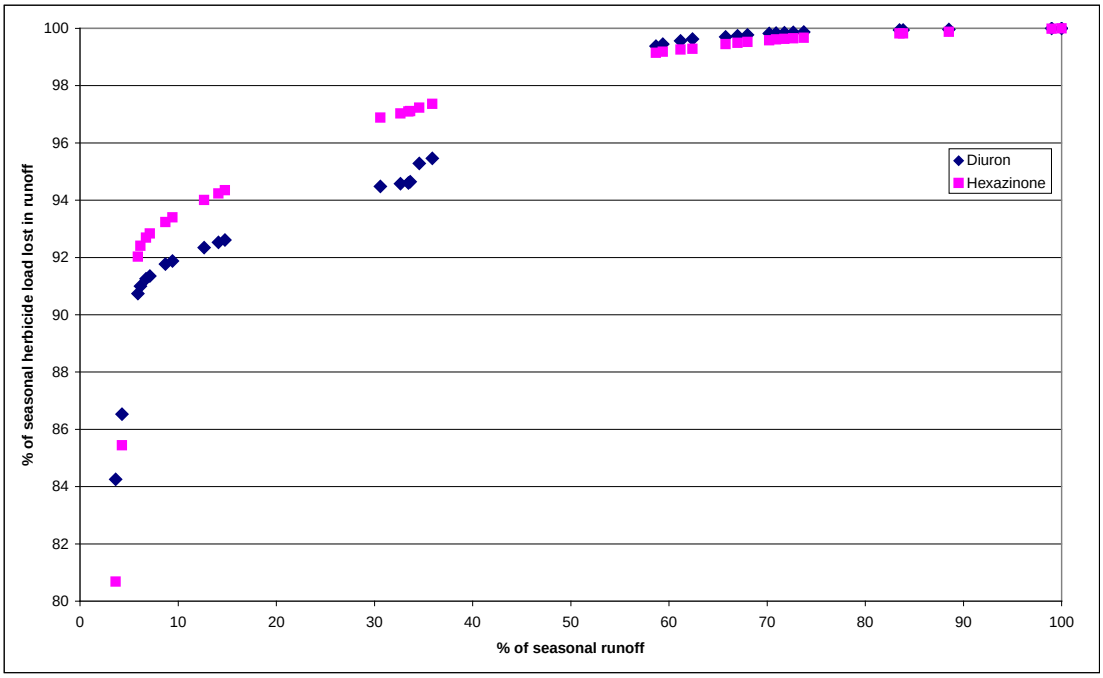

Figure 2 Cumulative herbicide loading in runoff plotted as a function of cumulative seasonal runoff, Victoria Plains site 2010/11

Photo: Kaela McDuffie, Mackay collecting trash and surface soil samples for herbicide analysis.