

**LWRRDC/CRDC/MDBC
COTTON PESTICIDES PROGRAM**

FINAL REPORT

TITLE: USY8 - FATE OF ENDOSULFAN IN WATER

ABSTRACT

This project tested a hypothesis that the presence of endosulfan sulphate in river water could be used as a convenient indication of river contamination by surface runoff or on dust rather than from drift or volatilisation. The following findings falsify this hypothesis:

- A mixture of α - and β - isomers of endosulfan at low concentrations (5 to 50 $\mu\text{g L}^{-1}$) can be converted to endosulfan sulphate in river water.
- Nevertheless, no endosulfan sulphate formation occurred in the pH range 5-9 in pure water, allowing the conclusion to be made that endosulfan sulphate formation is strictly biological; the microbial content of river water or of other biota is apparently sufficient to ensure a significant conversion rate at the low endosulfan concentrations found in river water,
- River water and laboratory media inoculated with blue-green algae degraded endosulfan at a significant rate, but no endosulfan sulphate was formed.

The project has clearly demonstrated that measurement of endosulfan sulphate concentrations in river water cannot be used as a direct indication of the extent of surface runoff. Where drift or volatilisation allows water to be contaminated to concentrations of the order of 0.1-1.0 $\mu\text{g/L}$, endosulfan sulphate formation to levels of 0.01-0.10 $\mu\text{g/L}$ will be expected to occur during the next 2-3 days. At alkaline pH values of 8 or greater, the formation of equal or greater concentrations of non-toxic endosulfan diol will also occur. Formation of endosulfan sulphate rather than dissipation as endosulfan diol formation or by volatilisation from water significantly prolongs the lifetime of endosulfan residues in water because of its greater stability.

BACKGROUND REVIEW

Endosulfan is regularly found in summer as a significant contaminant in rivers in cotton growing areas of NSW by the Central and North West Regions Water Quality Program carried out by the NSW Department of Land and Water Conservation (Cooper, 1996). The chemical analyses are limited to the parent isomers and endosulfan sulphate which is a toxic breakdown product.

Endosulfan sulphate is the most frequent form of contamination of river waters with endosulfan, but when this study began, there was no clear evidence that it is formed in water. However, the degradation of endosulfan on plants and in soil has been shown to produce endosulfan sulphate (Kennedy *et al.*, 1997). If there is no direct formation of endosulfan sulphate in river water, most of the endosulfan sulphate can be considered as entering the river system in run-off, either as a solution in water or carried on sediment, rather than by direct contamination by spray drift with subsequent conversion. Testing