CHAPTER 5

CONCLUSION

5.0 CONCLUSION

Following introduction of [^{14}C]DDT in the model ecosystem, [^{14}C]activity in water was observed to decreased from a maximum of 96.9% to 0.4% of the applied activity at the end of 48 hours. At the end of 3 days [^{14}C]activity in water approached background levels. No metabolites were detected in water.

The maximum level of [^{14}C]activity in the sediment was 85-87% of the applied activity at the end of 21 days. The level of [^{14}C]activity in the sediment expressed in concentration terms ranged between 0.02 to 0.05μg/g in the first 7 days of the experiment, thereafter increasing to a maximum of 0.10μg/g at the end of 21 days following application. Both bound and extractable residues in sediments increased with time, with the maximum concentration 0.04 and 0.05 μg/g, respectively. In the sediment samples DDE was the major metabolite detected (0.003 - 0.008 μg/g), first observed at the end of 24 hours, DDD (0.002 μg/g) was detected at the end of 3 weeks. DDT was present in all samples (0.004 - 0.020 μg/g).

The level in cockles appear to remain fairly constant over the whole study period ranging from 20 - 22% of the applied activity. Bound residues in cockles increased from 0.03 μg/g on day 7 to 0.05 μg/g at the end of the study period, while the extractable residues decreased to 0.02μg/g in the same period. In cockles DDE (0.001 - 0.002 μg/g) was the major metabolite, initially detected at the end of 7 days. DDD (0.001μg/g) was detected at the end of 3 weeks. DDMU was not detected at all during the course of the study.

Hence, result from the present investigation illustrated the various pathway with regards to DDT in the tropical mudflat ecosystem. Consistent with its lipophilic characteristic, DDT was seem to partition rapidly from the water phase into the organic rich sediment. A significant amount of the chemical was also seen to bioconcentrate in the cockle tissue. Metabolism of DDT was observed in both sediment and cockles giving rise to DDE and DDD. However during the course of the study DDMU was not detected.

When the distribution of lindane was examined in the model mudflat ecosystem under semistatic condition the concentrations of the chemical in water was found to be less than 5% of the nominal

concentration at the end of 24 hour exposures. The half lives of lindane in estuarine water under aerated and non-aerated conditions were found to be 21.9 and 43.0 hours, respectively. The concentration of lindane in sediment increased throughout the duration of the experiment. At the end of the experiment the concentrations of lindane in sediment were found to be 46.1 and 82.2 μg/kg at a exposure concentrations of 5 μg/L and 15 μg/L, respectively. While in cockles the concentrations of the insecticide were 33.1 μg/kg and 56.2 μg/kg at a exposure concentration of 5 μg/L and 15 μg/L, respectively.

Volatilization of [^{14}C]-lindane from the mudflat ecosystem showed that the maximum organic volatile was observed at the end of 21days amounting to 13.62% of the applied activity. Maximum production of $^{14}CO_2$ was 0.2% of the applied activity at the end of 21-day. The [^{14}C]activity in the water was 0.05% at the end of 7 days, decreasing to 0.03% at the end of 21-days. Extractable residues from mudflat soils were 48.06% of the applied activity at the end of 7 days, increasing to 61.43% at the end of 21days. Bound residues were 2.99% of the applied activity at the end of 7 days and increase to 4.95% of the applied activity at the end of 21 days.

The adsorption of lindane was also examined in the mudflat soil (MS) as well as in two soil types taken from agricultural land designated (A and B). The adsorption isotherms of lindane in mudflat soils exhibited the L type, attributed to the high OM content (8.9%) of these soils. The pesticide adsorption capacity of the mudflat soil was determined to be 1.20 ($LogK_{OM}$), while those from two agricultural soils were found to be 1.00 and 1.17. The order of adsorption was hence determined to be MS > B > A which was consistent with the OM content in the soils. The results obtained in this study indicated the role of OM content in the adsorption of lindane by the soils.

Lindane was also observed to undergo biodegradation in the mudflat soils. Hence, lindane disappeared more rapidly from non-sterilized soil compared to the sterilized soil. Less than 7% of the applied chemical was detected in non-sterilized soils at the end of 60 days compared to 65% from sterilized soils in the same period. The microbial biomass was found to be 3.84 mgC/g of mudflat soil while the initial respiration rate was 0.27 CO_2-C evolved mg/g soil.

The results of these studies clearly demonstrated the roles of various processes in determining the distribution of lindane in

the model mudflat ecosystem. Volatilization, adsorption and biodegradation processes appeared to be major pathways resulting in the dissipation of lindane in model mudflat ecosystem, as well as bioconcentration by cockles were observed to be increasingly significant with continued exposure.

Bioconcentration of DDT and lindane in cockles might present some degree of risk to human health from the consumption of the bivalve, particularly taking into consideration that cockles are normally marketed immediately after harvest without depuration. Furthermore, the presence of DDT and lindane within cockles and sediments also serve as an indication for the extent of pollution due to the insecticide.