COMPARISON OF ORGANOCHLORINE PESTICIDE RESIDUES IN FRESHWATER FISH, MOLLUSKS AND SEDIMENTS FROM FIVE MAIN FISHING AREAS IN VIENTIANE LAOS

By

SOUTHAVILAY BOUTAH

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Master of Science

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirements for the degree of Master of Science

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Chairman: **Associate Professor Mohamad Pauzi Zakaria, Ph.D.**

Faculty: **Science and Environmental Studies**

The use of organochlorine pesticides in rice growing in Laos is widespread. Potential contamination of pesticides to the aquatic organisms and sediments is a major concern. This study investigates the organochlorine pesticide contamination in fish, mollusks, and sediment from five main fishing areas of Vientiane, the capital of Laos. The fishing areas are located within the rice fields around Vientiane.

Fifteen species of freshwater fish and one species of mollusks were homogenized, extracted, fractionated and subsequently analysed with Gas Chromatography Mass Spectrometry (GC-MS). Sediment samples were extracted and fractionated and analysed similarly as those of fish and mollusks.

The target compounds of interest were lindane, chlordane, dieldrin, DDT and its derivatives. The result of this study shows that DDT, lindane, HCH, chlordane and

dieldrin were present in 14 of 15 species of fish and mollusks. DDT, chlordane and dieldrin were present in the samples of sediment. This study also shows that lindane and chlordane has the highest concentrations both in fish and mollusk while DDT and its metabolites reveals next highest concentrations. Results show that highest concentrations of DDT, dieldrin and chlordane were observed in sediments.

Results from this study indicate that organochlorine contamination occurs in fish and mollusks. Laotian depends on fish and mollusks for their dietary needs of protein and this is a cause of major concern for potential human health impacts. Furthermore, sedimentary environments where the study were being conducted shows appearance of DDT, dieldrin and chlordane and this would increase the bio-availability of those compounds to the aquatic organisms including fish and mollusks.

Although, this study indicate that the levels of pesticides in fish, mollusk and sediment are below the World Health Organization (WHO) standards, the authority should try their best to reduce pesticide contamination in Vientiane, Laos. This study is the first of its kind in Laos and it provides important base-line information for policy makers and monitoring agencies.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Master Sains

PERBANDINGAN PESTISIDA ORGANOKLORIN DALAM IKAN AIR TAWAR, MOLASKA DAN SEDIMEN DARI LIMA KAWASAN PENANGKAPAN IKAN, VIENTIANE, LAO

Oleh

SOUTHAVILAY BOUTAH

March 2004

Pengerusi: **Profesor Madya Mohamad Pauzi Zakaria, Ph.D.**

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Penggunaan pestisida organoklorin didalam sektor penanaman padi di Laos adalah menyeluruh. Kemungkinan pencemaran pestisida ini dalam organisma akuatik dan sedimen amat membimbangkan. Pencemaran pestisida organoklorin telah dikaji dalam ikan, molaska dan sedimen yang telah diambil dari lima kawasan penangkapan ikan di Vientiane, ibu negera Laos.

Lima belas spisis ikan dan satu spisis molaska telah dikisar-lumat, ekstrak dipisah dan dianalisiskan dengan kromatografi gas spektrometri jisim (GC-MS). Sampel sedimen telah diekstrakkan dengan menggunakan pengekstrak soklet dan telah dipisah dan dianalisiskan mengikut kaedah yang sama dengan sampel ikan dan molaska.

Sebatian pestisida didalam kajian ini ialah lindan, klodan, dieldrin, DDT termasuk derivatifnya. Keputusan kajian telah menunjukkan DDT, lindan, HCH, klodan dan

dieldrin telah didapati didalam 14 spisis ikan dan moluska. Sementara sedimen pula, keputusan kajian menunjukkan kewujudan DDT, klodan dan dieldrin. Keputusan kajian juga telah menunjukkan lindan dan klodan wujud dalam kepekatan yang tertinggi dalam ikan dan moluska sementara DDT dan metabolit-metabolitnya menunjukkan kepekatan yang kedua tertinggi. Keputusan kajian bagi sedimen telah menunjukkan DDT, dieldrin dan klodan mempunyai kepekatan tertinggi.

Keputusan kajian ini amat membimbangkan kerana penduduk Vientiane bergantung kepada ikan sebagai sumber protin. Kajian ini juga mendapati kepekatan DDT, dieldrin dan klodan yang tinggi didalam sedimen yang boleh menyebabkan kedapatan biologi (bioavailabiliti) yang tinggi.

Walapun kajian ini menunjukkan kepekatan pestisida berada dibawah tahap piawai WHO, pihak berwajib di Laos harus mencuba untuk mengurangkan pencemaran tersebut. Kajian ini ialah kajian yang pertama dilakukan untuk mengetahui taburan pestisida didalam ikan, moluska dan sedimen di Laos. Kajian ini menyumbang maklumat awal kepada pembuat dasar dan agensi pemonitoran.

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I certify that an Examination Committee has met on March, 11 2004 to conduct the final examination of Southavilay Boutah on his Master of Science thesis entitled "Comparison of Organochlorine Pesticide Residues in Freshwater Fish, Mollusks and Sediments From Five Main Fishing Areas in Vientiane, Laos." in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee Members for the candidate are as follows:

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This thesis submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirements for the degree of Master of Science. The member of the Supervisory Committee are as follows:

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DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently for any other degree at UPM or other institutions.

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SOUTHAVILAY BOUTAH

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