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: MAJOR ENVIRONMENTAL SCIENCE

KEY WORD: TOXICITY / CADMIUM / COPPER / ZINC / *Moina macrocopa*

TASSANEE CHETWITTAYACHAN : LETHAL AND SUBLETHAL EFFECTS OF PAIRED MIXTURES OF CADMIUM, COPPER AND ZINC ON WATER FLEA , *Moina macrocopa* Straus. THESIS ADVISOR : ASSOC. PROF. THAMNOON ROCHANABURANON, Ph.D. 137 pp. ISBN 974-636-759-5.

Static bioassay tests were conducted to determine acute toxic effects of paired mixtures of cadmium, copper, and zinc on water flea, *Moina macrocopa* Straus. The concentration of paired mixtures was expressed in "Toxic Unit". Observed mortality data of these testes were measured in terms of median lethal concentrations with 95 % confidence limit at 48 hours. The results showed that 48-h  $LC_{50}$  (mean and range) of cadmium-copper mixtures at toxicity ratios 1:1, 1:2 and 2:1 were 2.63 (2.60-2.66), 2.33 (2.29-2.36) and 3.23 (3.18-3.27) TU, respectively. Moreover, 48-h  $LC_{50}$  values of cadmium-zinc mixtures at toxicity ratios 1:1, 1:2 and 2:1 were 2.65 (2.56-2.74), 3.66 (3.53-3.80) and 5.49 (5.38-5.61) TU, respectively, whereas the mixture of zinc-copper at toxicity ratios 1:1, 1:2 and 2:1 were 4.22 (4.08-4.36), 3.52 (3.43-3.60) and 3.24 (3.11-3.40) TU, respectively. This result was possible to conclude that the mixed combination of cadmium-copper was more toxic than those of cadmium-zinc, and zinc-copper, in respective order. The combined effects of the paired mixtures of these metals exhibited antagonism. Sublethal effects were conducted under static renewal condition. The cadmium-copper mixtures at 0.24, 0.39 and 0.57 TU, and the cadmium-zinc mixtures at 0.26, 0.44 and 0.66 TU have quite obvious effects on the reproduction by reducing the numbers of young production, parthenogenesis capacity, length and longevity of water flea from F1 to F5 particularly at the maximum concentrations (0.57 and 0.66 TU). However, the zinc-copper mixtures at 0.33, 0.54 and 0.81 TU had no effect on reproduction, growth and longevity of the water flea. In addition, 16% reproductive impairment studies based on Biesinger and Christensen method were calculated. The maximum acceptable toxicant and safe concentration values of cadmium, copper and zinc in paired mixtures solutions for aquatic animals especially the water flea were 0.0121, 0.00329 and 0.096 mg/l, respectively.

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