

UNNOP HOMCHAN : TOXICITY OF SOME HEAVY METALS FROM TREATED MUNICIPAL WASTE WATER SLUDGE ON CHINESE KALE (Brassica oleracea L. Var. alboglabra Bailey) AND LETTUCE (Lactuca sativa L.) IN GREENHOUSE. THESIS ADVISOR : ASST. PROF. ORAWAN SIRIRATPIRIYA, D.Sc., 197 pp. ISBN 974-582-009-1

Toxicity of heavy metals (iron, manganese, zinc, copper, nickel, lead and cadmium) from sewage sludge at application rate 20 tonnes DM sludge/ha. (50 gm./pot) on chinese kale (Brassica oleracea L. Var. alboglabra Bailey) and lettuce (Lactuca sativa L.) was studied. Agricultural soils from Tambon Ban-chang Amphore Mueng Changwat Pathumthani and sewage sludge from anaerobic digester of Havi Khavang treatment plant were example of case study. Pot experiment was conducted at a greenhouse. The experimental design was 2X4 factorial incompletely randomize design with 3 replications. Kale and lettuce were planted on treated soils that had applied with certain amount of heavy metal inorganic salts 4 level equal to heavy metal contents in the sludge (available form = level 1, total form = level 4). Both heavy metal contents in soils and plants, and plant productivity were observed.

The results showed that zinc contents in the soils increased significantly ( $P \leq 0.01$ ) by increasing the heavy metal content of inorganic salts. This behavior of zinc appeared in edible part of both kale and lettuce. However, this zinc contents in edible parts of lettuce planted in the soils applied the heavy metal inorganic salts equal to total content in the sludge was higher than the contents of various plants, but it was still lower than the toxic dose. Hence, zinc will be chosen as an indicator to indicated the risk tendency of heavy metals from the sludge. Copper and cadmium contents in the soils for both kale and lettuce and only lead contents in the soil for kale followed the same pattern as already described for zinc. However, there was no obvious tendency in plants. In addition iron, manganese and nickel contents in both soils and plants including lead in the soils for lettuce showed no obvious tendency to follow the pattern.

Each heavy metal could be released from sludge differently after the first harvest in an order with the three fastest ones as follow : copper, zinc and cadmium respectively. When plant productivity was considered the adverse effect of heavy metals was not observed. Not only the productivity, especially lettuce, applied with the heavy metal inorganic salts was higher than the productivity applied with chemical fertilizer (formula 15-15-15) and equal to productivity applied with the sludge significantly ( $P \leq 0.01$ ), but also yielded the more healthier plants. Risk of heavy metal toxicity applied at the rate of 20 tonnes DM sludge/ha. for kale and lettuce cultivation was unnoticable. However, the result suggested that with mentioned rate safe application time should lie at two harvests interval.