Increasing amount of paper mill sludge that need to be disposed off by industries has recently raised concern for an alternative environmentally sustainable application. Recycled paper mill sludge (RPMS) is an active organic material and has potential to supply nutrients for crops growth. However, the limitation to its usage is the presence of heavy metals. Hence it is important to understand the heavy metal accumulation in the soil systems as well as plant uptake due to RPMS application. Therefore, glasshouse and field study were conducted to investigate the heavy metals concentrations in soil and plant and factors controlling heavy metals behavior during one year application of raw and composted RPMS.

Glasshouse study was conducted in the glasshouse unit of the Faculty of Agriculture, Universiti Putra Malaysia. Orthosiphon stamineus was used as the test crop in 20 kg pots with 4 treatments and 4 replications arranged in a complete randomized design (CRD). The field study was located at the University Agricultural Park, Selangor, Malaysia. Twelve plots were established and each plot consisted of 15 plants of Orthosiphon stamineus with 4 treatments and 4 replications arranged in a randomized complete block design (RCBD). The treatments for both the glasshouse and field were control, 100 kg N ha\(^{-1}\) of inorganic fertilizer (recommended rate) and 200 kg N ha\(^{-1}\) of raw and RPMS compost, respectively. Treatments were applied once at the beginning of the experiment during transplanting of seedlings. This study was carried out of for 4-crop cuttings of Orthosiphon stamineus with harvesting period of every 3 months.

In the glasshouse experiment, application of composted and raw RPMS gave higher concentration of heavy metals compared to the control. The heavy metals content do not exceed the heavy metals investigation levels for Malaysian soils which is the level taken at the 95\(^{th}\) percentile of the heavy metals data for agricultural soils, with the exception of cadmium. After application of raw and composted RPMS for all treatments, the levels of heavy metals in plant foliar tissues were below the Maximum Permitted Concentration (MPC) as stated in the Malaysian Food Act (1983) and Food Regulations (1985) which was established on `as consumed` weight basis. An elevated heavy metals concentration in Orthosiphon stamineus is of great concern to the herbal tea quality. Results of the field study followed the same trend as the laboratory study but resulted in lower concentrations of heavy metals, presumably due to environmental conditions such as rainfall, temperature and leaching, which may have resulted in less accumulation of heavy metals in the soil and plant uptake. The results show relationship between soil pH with total Cd in soil, total carbon in soil with total and available Cu in soil and available P in soil with total Cd and Pb in soil.

This study indicates that raw and RPMS compost can be a supplementary N fertilizer and safe to be utilized for edible plants. Recycled paper mill sludge has not been utilized in Malaysia due to lack of information on the suitability of this waste for land application. Therefore, the results of both glasshouse and field experiments can contribute to better understanding of recycling this waste on land.

**Keywords**: Heavy Metals, Paper Mill Sludge, Organic Fertilizer, Soil Properties, Correlation Analysis