STUDY TO DETERMINE LEVEL OF CADMIUM IN SOIL AND CACAO IN GUNUNG KIDUL, YOGYAKARTA, INDONESIA

ABSTRACT

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Heavy metal contamination is something that is highly avoided in agricultural products, including cacao products. The accumulation of heavy metal content that enters the human body can have a negative impact on human health. Cadmium (Cd) is one of the metal elements that is often found contained in cacao plants which usually accumulates in cacao beans. This study aimed to determine the amount and the levels of cadmium in cacao soil and cacao beans, and correlate it to soil characteristics (texture, particle density, bulk density, pH) of Nglanggeran village in Gunung Kidul, Yogyakarta. Three points from each site of cacao land were selected diagonally to be taken as the soil sample, where the soil was taken from 0-10 cm and 10-20 cm in depth. Plantation management (tree age, fertilizer, irrigation, drainage, pruning) was noted from an interview to the farmers. The cacao plant sample used is the cacao nib that was cleaned from the pulp and dried with cabinet dryer. The methods used in measuring the Cd content were the AOAC method by using ICP-MS. The Cd content in the soils ranged from 0.05 mg kg^{-1} to 0.24 mg kg^{-1}. This result showed all sites of cacao farms in Nglanggeran were below the critical limit of Cd in agricultural soils based on multiple different country (China 1.5-4 mg kg^{-1}; India 3-6 mg kg^{-1}; Vietnam 2 mg kg^{-1}; and Europe Union 3 mg kg^{-1}). Meanwhile the Cd content in the cacao beans ranged from 0.05 mg kg^{-1} to 0.42 mg kg^{-1} in which 2 locations in the study area were higher than the maximum limits of Cd in dried cacao beans established by WHO (0.30 mg kg^{-1}), but none of the locations were higher than the maximum limits of Cd according to Indonesian standard (SNI 7387:2009 with 0.5 mg kg^{-1}). None of the soil properties in all depth showed significant correlation with cadmium content both in soil and in cacao beans except for soil organic matter in 10-20 cm depth ($r=0.67$, $P<0.05$). Cadmium content in the soil also had no significant correlation with cadmium content in the cacao beans.

Keywords: soil, cadmium, contamination, cacao, Nglanggeran, Gunung Kidul