

Logam Berat Karsinogenik Dalam Tanah Dan Tanaman Pisang Mas Di Lingkungan Tambang Nikel Di Baburino, Halmahera Timur, Pulau Halmahera

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ABSTRAK

Penelitian ini bertujuan menganalisis tingkat cemaran logam berat karsinogenik pada tanah dan tanaman pisang mas (*Musa acuminata*) di lahan perkebunan masyarakat Desa Baburino, Kecamatan Maba, Halmahera Timur, Maluku Utara dan untuk melihat rasio logam berat karsinogenik dalam tanah, akar dan buah tanaman pisang. Pengambilan sampel tanah dilakukan pada kedalaman 0–20 cm di sembilan titik dengan jarak bervariasi dari lokasi pertambangan nikel. Analisis laboratorium meliputi sifat kimia tanah (pH, C-organik, kapasitas tukar kation, kejenuhan basa, dan tekstur) serta kandungan logam berat nikel (Ni), kromium (Cr), dan arsenik (As) menggunakan metode X-Ray Fluorescence (XRF). Hasil penelitian menunjukkan bahwa konsentrasi Ni dan Cr dalam tanah umumnya jauh melebihi ambang batas baku mutu, masing-masing mencapai lebih dari 14.000 mg/kg dan 10.000 mg/kg, sedangkan As terdeteksi hingga 20 mg/kg. Kandungan tinggi logam berat tersebut dipengaruhi oleh faktor geogenik dari tanah ultrabasa serta aktivitas pertambangan nikel di sekitar lokasi. Pada jaringan tanaman, akar pisang mengakumulasi Ni dan Cr dalam jumlah besar, sementara kandungan pada buah juga melebihi ambang batas aman konsumsi ($\text{Ni} \leq 10 \text{ mg/kg}$; $\text{Cr} \leq 1,3 \text{ mg/kg}$), yang menandakan adanya risiko bioakumulasi pada rantai pangan. Sebaliknya, arsenik tidak terdeteksi dalam jaringan akar maupun buah karena kemungkinan terikat kuat pada oksida Fe dan Al sehingga tidak tersedia bagi tanaman. Sifat kimia tanah, terutama pH, kejenuhan basa, C-organik, dan KTK, turut memengaruhi mobilitas logam, meskipun litologi ultrabasa dan aktivitas tambang tetap menjadi faktor dominan penyebab pencemaran.

Kata Kunci: Kecamatan Maba, tanah ultrabasa, pencemaran tanah, logam berat karsinogenik, *musa acuminata*.

Carcinogenic Heavy Metals in Soil and Mas Banana Plants in a Nickel Mining Environment In Baburino, East Halmahera, Halmahera Island

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ABSTRACT

This study aims to analyze the level of carcinogenic heavy metal contamination in the soil and banana plants (*Musa acuminata*) in the plantation land of the Baburino Village community, Maba District, East Halmahera, North Maluku and to see the ratio of carcinogenic heavy metals in the soil, roots and fruit of banana plants. Soil samples were collected at a depth of 0–20 cm from nine observation points located at varying distances from nickel mining areas. Laboratory analyses were conducted to determine soil chemical properties (pH, organic carbon, cation exchange capacity, base saturation, and texture) and heavy metal concentrations of nickel (Ni), chromium (Cr), and arsenic (As) using the X-Ray Fluorescence (XRF) method. The results showed that Ni and Cr concentrations in soils significantly exceeded the permissible limits, reaching more than 14,000 mg/kg and 10,000 mg/kg respectively, while As levels reached up to 20 mg/kg. These high concentrations are attributed to the combined effects of ultrabasic lithology and intensive nickel mining activities. In plant tissues, banana roots exhibited high accumulation of Ni and Cr, whereas their concentrations in fruits also exceeded the safe consumption limits (Ni ≤ 10 mg/kg; Cr ≤ 1.3 mg/kg), indicating potential bioaccumulation risks within the food chain. Conversely, arsenic was not detected in either roots or fruits, likely due to its strong binding to Fe and Al oxides, which limits its bioavailability. Soil chemical properties such as pH, base saturation, organic carbon, and cation exchange capacity influenced metal mobility, yet ultrabasic parent material and mining activity remained the dominant sources of contamination.

Keywords: Maba District, ultrabasic soil, soil pollution, carcinogenic heavy metals, *musa acuminata*