

## SARI

Di Desa Jendi, Kecamatan Selogiri, Kabupaten Wonogiri, Jawa Tengah terdapat penambangan emas dan pengolahan bijih emas tradisional yang dilakukan menggunakan teknik amalgamasi. Kegiatan tersebut pada umumnya berupa penggalian bahan tambang, penghancuran atau penghalusan, dan pengolahan. Aktivitas pengolahan emas dengan metode amalgamasi menghasilkan *tailing* mengandung mineral sulfida yang mengakibatkan terjadinya air asam tambang dengan pelepasan unsur logam berat ke dalam air dan pengendapan logam berat pada tanah. Konsentrasi logam berat yang tinggi pada dalam tanah dapat mengakibatkan pencemaran lingkungan. Berdasarkan hal tersebut, peneliti bertujuan untuk melakukan percobaan fitoremediasi dengan menganalisis kemampuan tanaman jarak pagar (*Jatropha curcas*) dan bayam (*Amaranthus spinosus* L.) dalam meremediasi tanah yang tercemar Pb dan As di daerah pengolahan tambang emas tersebut. Sampel urat/mineral diambil dari hasil tambang dan *tailing* hasil pengolahan emas dianalisis untuk mengetahui nilai konsentrasi Pb dan As sebagai sumber pencemar pada tanah. Sampel tanah tercemar yang di ambil di area pengolahan emas tradisional dengan interval kedalaman 5, 10 dan 15 cm serta tanah kontrol sebagai kondisi natural yang di ambil di daerah Cangkringan, Yogyakarta. Sifat fisik tanah yaitu ukuran butir dan sifat kimia tanah yaitu pH, Kapasitas Tukar Kation (KTK), kandungan organik, dan kandungan mineralogi tanah, dianalisis dengan tujuan untuk mengetahui kemampuan tanah dalam menahan atau menyerap kontaminan di dalam tanah. Analisis logam berat Pb dan As dilakukan pengukuran menggunakan metode *Inductively Coupled Plasma Atomic Emission Spectroscopy* (ICP-AES) pada sampel urat/mineral, *tailing*, tanah tercemar dan tanah kontrol dengan tujuan menganalisis kadar awal konsentrasi Pb dan As, kemudian konsentrasi Pb dan As pada tanaman jarak pagar (*Jatropha curcas*) dan bayam (*Amaranthus spinosus* L.) dianalisis berdasarkan waktu pemanenan. Percobaan fitoremediasi dilakukan di *greenhouse* selama 3 bulan dengan jumlah 12 sampel di tiap tanaman dengan waktu pengukuran kontaminan pada pemanenan 1 (umur 1 bulan), pemanenan 2 (umur 2 bulan) dan pemanenan 3 (umur 3 bulan). Hasil penelitian jarak pagar (*Jatropha curcas*) dan bayam (*Amaranthus spinosus* L.) menunjukkan semakin lama usia pemanenan jarak pagar (*Jatropha curcas*) dan bayam (*Amaranthus spinosus* L.) akan semakin tinggi konsentrasi Pb dan As yang diserap, dengan nilai efektivitas serapan kedua tanaman terhadap konsentrasi Pb dan As antara 1,6 % hingga 7,5 %. Berdasarkan kedua tanaman tersebut akumulasi tertinggi pada konsentrasi Pb dan dibuktikan tanaman jarak pagar (*Jatropha curcas*) dapat mengakumulasi kontaminan lebih tinggi. Karakteristik tanah dapat mempengaruhi efektivitas serapan dalam proses fitoremediasi jarak pagar (*Jatropha curcas*) dan bayam (*Amaranthus spinosus* L.), terutama pada kandungan organik dan kandungan montmorilonit dalam tanah. Hal tersebut ditunjukkan dari hasil nilai efektivitas serapan, *mass balance* dan *removal efficiency* yang memiliki nilai relatif rendah. Berdasarkan hasil tersebut, kedua tanaman ini mempunyai potensi yang cukup baik dan dapat dipertimbangkan sebagai tanaman fitoremediasi pada konsentrasi Pb dan As.

**Kata Kunci:** pengolahan bijih emas, pencemaran, logam berat, tanah, fitoremediasi.

## ABSTRACT

*In Jendi Village, Selogiri Subdistrict, Wonogiri District, Central Java, there is small scale gold mining activity and gold ore processing with the amalgamation method. These activities generally include excavating mining materials, crushing or refining, and processing. Gold processing activities with the amalgamation method produce tailing containing sulfide minerals causing acid mine drainage by releasing heavy metal elements into the water and deposition on the soil. High concentrations of heavy metals in the soil can cause environmental pollution. In this issue, this study aims to investigate the potential of *Jatropha curcas* and *Amaranthus spinosus* L. plant for remediation of Pb and As contaminated soil in gold mine processing area. Veins/mineral samples obtained from mining products and tailings from gold processing were analyzed to determine the value of Pb and As concentrations as a source of contaminants on the soil. Contaminated soil samples obtained in the gold processing area with intervals of 5 cm, 10 cm, and 15 cm depth in the soil, control soil samples as the natural condition obtained in Cangkringan area, Yogyakarta. The physical properties of soil, such as grain size, and chemical properties of soil, such as pH, cation exchange capacity (CEC), organic content, and mineralogy content were analyzed to determine the ability to hold or absorb contaminants on the soil. The heavy metal analysis was measured by Inductively Coupled Plasma Atomic Emission Spectroscopy method (ICP-AES) on samples of veins/minerals, tailings, contaminated soil, and control soil to analyze the initial values of Pb and As concentrations, and then the Pb and As concentrations in *Jatropha curcas* and *Amaranthus spinosus* L. were analyzed based on harvest time. The phytoremediation experiment was conducted in the greenhouse for three months with 12 samples of *Jatropha curcas* and 12 samples of *Amaranthus spinosus* L. with contaminants measuring at harvest time 1 (1 month), harvest time 2 (2 months), and harvest time 3 (3 months). The results of the study on *Jatropha curcas* and *Amaranthus spinosus* L. based on exposure time with soil media showed that the longer harvesting time would increase the absorption of Pb and As concentrations and from both plants, the highest accumulation was at the Pb concentration. This study obtained the highest Pb and As accumulation values in *Jatropha curcas*. *Jatropha curcas* and *Amaranthus spinosus* L. were quite effective in accumulating Pb and As concentrations in contaminated soils, sorption effectiveness values ranged from 1.6 % to 7.5 %. Soil characteristics affect the effectiveness of absorption in *Jatropha curcas* and *Amaranthus spinosus* L., especially on the organic matter and montmorillonite content in the soil. The results showed that the absorption effectiveness, mass balance, and removal efficiency had relatively low values. Based on these results, both plants can be excellent candidates for phytoremediation plants that accumulated Pb and As concentrations.*

**Keywords:** gold ore processing, contamination, heavy metals, soil, phytoremediation.