

## INTISARI

Dinamika silikon (Si) di tanah dikontrol oleh kondisi pedologis tanah. Tanah-tanah di Cekungan Yogyakarta terbentuk dari beragam bahan induk yang berasosiasi dengan lapukan batuan Tersier dan endapan vulkanik Merapi Muda. Perbedaan bahan induk berpengaruh pada watak pedologis. Penelitian sebelumnya menunjukkan tanah sawah di Pulau Jawa (termasuk Cekungan Yogyakarta) mempunyai kadar Si-tersedia untuk tanaman tertinggi di Asia Tropis. Namun, belum dijumpai adanya dokumentasi mengenai hubungan watak pedologis tanah dengan dinamika Si secara rinci di Cekungan Yogyakarta. Penelitian ini bertujuan mengisi kekosongan tersebut dengan meneliti dinamika Si pada tanah-tanah di Cekungan Yogyakarta yang watak pedologisnya bervariasi. Tujuh profil tanah digali, dideskripsikan, dan dianalisis watak pedologisnya. Bentuk-bentuk Si diukur dengan ekstraksi spesifik ( $\text{Na}_2\text{CO}_3$ : Si-Alk, Na-asetat: Si-Na-asetat, asam ammonium oksalat: Si-oksalat, ditionit sitrat: Si-DC, dan  $\text{CaCl}_2$ : Si- $\text{CaCl}_2$ ). Nasabah antara bentuk-bentuk Si tersebut dengan watak pedologis digunakan untuk menjelaskan dinamika Si. Hasil penelitian menunjukkan dinamika Si pada kelompok tanah kasar yang berasal dari endapan vulkanik Kuartar dikontrol oleh tingkat pelapukan tanah (disolusi plagioklas dan sanidin), proses reduksi-oksidasi (reduksi oksida besi kristalin), dan vegetasi (pelonggokan fitolit). Dinamika Si pada kelompok tanah halus dari endapan lempung dan lapukan batuan Tersier ditentukan oleh proses reduksi-oksidasi dan proses penjerapan-pelepasan kembali Si oleh oksida-oksida bebas dan mineral monmorilonit. Penelitian ini secara jelas menunjukkan faktor-faktor pedologis seperti variasi bahan induk, topografi, dan penggunaan lahan memengaruhi dinamika Si pada tanah-tanah di Cekungan Yogyakarta. Faktor-faktor di atas perlu dipertimbangkan dalam penelitian mengenai siklus biogeokimia Si pada lansekap peralihan struktural-vulkanik di masa depan.

**Kata Kunci:** Dinamika Si, watak pedologis, tanah kasar, tanah halus, Cekungan Yogyakarta.

## ABSTRACT

The dynamics of silicon (Si) in soils are controlled by pedological conditions. The soils in the Yogyakarta Basin have developed from diverse parent materials associated with the weathering of Tertiary rocks and the volcanic deposits of Mount Merapi. Differences in parent materials influence pedological characteristics. Previous studies have indicated that paddy soils in Java (including the Yogyakarta Basin) contain the highest levels of plant-available Si in tropical Asia. However, there has been no detailed documentation on the relationship between soil pedological characteristics and Si dynamics in the Yogyakarta Basin. This study aims to address this gap by investigating the Si dynamics in soils with varying pedological conditions across the Yogyakarta Basin. Seven soil profiles were excavated, described, and analyzed for their pedological characteristics. Different forms of Si were measured through specific extractions ( $\text{Na}_2\text{CO}_3$ : Si-Alk, Na-acetate: Si-Na-acetate, ammonium oxalate: Si-oxalate, dithionite-citrate: Si-DC, and  $\text{CaCl}_2$ : Si- $\text{CaCl}_2$ ). The correlations between these Si forms and the pedological properties were used to explain Si dynamics. The results indicate that Si dynamics in coarse-textured soils, derived from Quaternary volcanic deposits, are controlled by the degree of soil weathering (dissolution of plagioclase and sanidine), redox processes (reduction of crystalline iron oxides), and vegetation (accumulation of phytoliths). Si dynamics in fine-textured soils, originating from clay deposits and Tertiary rock weathering, are determined by redox processes and the adsorption-desorption of Si by free oxides and montmorillonite minerals. This research clearly demonstrates that pedological factors such as variations in parent material, topography, and land use influence Si dynamics in the soils of the Yogyakarta Basin. These factors should be considered in future studies of the biogeochemical cycling of Si in transitional structural-volcanic landscapes.

**Keywords:** Si dynamics, pedological properties, coarse-textured soils, fine-textured soils, Yogyakarta Basin.