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# Sifat-sifat Kimia dan Mineralogi Tanah serta Kaitannya dengan Kebutuhan Pupuk untuk Padi (Oryza sativa), Jagung (Zea mays), dan Kedelai (Glycine max)

# Soil Chemical and Mineralogical Characteristics and Its Relationship with The Fertilizers Requirement for Rice (Oriza sativa), Maize (Zea mays) and Soybean (Glycine max)

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## ABSTRACT

Laboratory experiment was conducted to identify soil chemical and mineralogical characteristics from topsoil (0-20 cm) of Inceptisols, Oxisols, Vertisols, and Andisols, as well as its relationship with the requirement of NPK, lime, and organic matter fertilizers for rice, maize, and soybean at laboratory of Indonesian Soil Research Institute and Soil Science Department of Bogor Agricultural University. The result showed that Inceptisols was dominated by kaolinite (1:1), Oxisols by kaolinite and goethite (hydroxide), and Vertisols by smectite (2:1). Andisols had kaolinite and crystobalite (oxide) minerals in it, while amorphous materials could not be detected through X-ray Diffraction (XRD) method. The soil reaction of Inceptisols, Oxisols, and Andisols was acid; exchangeable (exch) Ca and Mg, the contents of K and P, as well as base saturation (BS) of the soils were low. On the contrary, the soil reaction of Vertisols was neutral; exch. Al and H were very low, whereas exch. Ca and Mg, the contents of K and P, as well as base saturation (BS) of the soil were high. Both Vertisols and Andisols had high cation exchange capacity (CEC) which was from permanent charge in Vertisols and from variable charge (organic matter) in Andisols. Fertilizer requirement for crops in the soil was affected by land use system, plant species, soil nutrient content and its behavior in the soil system.


Key words: Soil characteristics, fertilizer, rice, maize, soybean.

## PENDAHULUAN

Identifikasi sifat-sifat mineralogi liat dan kimia tanah-tanah pertanian sangat penting dilakukan karena sifat-sifat tersebut berkaitan erat dengan pendugaan potensi kesuburan tanah serta merupakan dasar penyusunan strategi pengelolaan tanah seperti pemupukan. Sifat-sifat tanah tersebut berkaitan erat dengan dinamika berbagai unsur hara di dalam tanah. Jenis dan jumlah mineral liat berpengaruh terhadap karakteristik kimiawi tanah, seperti: kapasitas tukar kation (KTK), besarnya fiksasi hara, dan lain-lain (Havlin et al., 1999).

Sumber muatan koloid tanah terdiri dari muatan permanen (permanent charge) dan muatan tergantung pH atau muatan variabel (pH dependent charge atau variable charge). Sumber muatan pada mineral liat tipe 2:1 (smektit) didominasi oleh muatan permanen, sedangkan pada liat tipe 1:1 (kaolinit) banyak terdapat muatan tergantung pH. Demikian pula mineral oksihidroksida seperti goetit, hematit, ferrihidrit, gibsit, dan mineral amorf lainnya umumnya didominasi oleh sumber muatan tergantung pH. Kapasitas tukar kation (KTK) tanah dipengaruhi oleh sumber muatan koloid tanah. Mineral liat tipe 2:1 memiliki KTK 30 (illit), 144-207 (vermikulit), dan 70 me/100 g (smektit). Sementara itu mineral lainnya yang didominasi oleh sumber muatan variabel mempunyai KTK 1-10 (kaolinit), 20-50 (alofan) dan 135 me/100g (imogolit) (Tan, 1998).

Ketersediaan hara dipengaruhi oleh dinamika hara atau proses jerapan dan pelepasan hara tersebut yang semuanya dikendalikan oleh koloid liat tanah. Besarnya jerapan kation atau anion oleh koloid tanah tergantung dari luas permukaan koloid tanah. Semakin luas permukaan koloid maka semakin banyak ion yang dapat dijerap. Luas permukaan mineral liat tipe 2:1 sekitar 700-800 $m^2/g$ (smektit) dan 57-152 $m^2/g$ (interstratifikasi mika-smektit), liat tipe 1:1 (kaolinit) 7-30 $m^2/g$, sedangkan alofan 157-484 $m^2/g$ (Tan, 1998). Hara N

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