

Kyaw Ngwe 2012: Potassium Chemistry in Paddy Soils under Tropical Savanna Climate. Doctor of Philosophy (Tropical Agriculture), Major Field: Tropical Agriculture, Faculty of Agriculture. Thesis Advisor: Professor Irb Kheoruenromne, Ph.D. 157 pages.

The purposes of the study on potassium chemistry of paddy soils developed under a tropical savanna climate were to determine different forms of potassium and to ascertain the influence of soil physical and chemical properties on their chemistry. Pedon analysis, field morphological and physicochemical and mineralogical properties were determined for five Vertisols including Ban Mi1 (Bm1), Ban Mi2 (Bm2), Chong Khae (Ck), Lop Buri (Lb) and Wattana(Wa) series; three Alfisols including Ubon (Ub), Tha Tum (Tt) and Doem Bang(Db) series; four Ultisols as Roi Et (Re), Phen (Pn), Renu (Rn) and Nakhon Phanom (Nn) series and one Inceptisol including Samut Prakan (Sm) series representative paddy soils in Thailand.

These paddy soils are acid to slightly alkaline and all soils have various textures which included clayey to sandy. They developed on local alluvium derived from limestone, wash and local alluvium from weathered sedimentary rocks, alluvium over marine deposits, mixed marine and local alluvium from metasedimentary rocks and recent alluvium on residuum from fine grained clastic sedimentary rocks.

The available K (soluble K + exchangeable K) was “very low” of Re, Pn, Rn (Ultisols), “low” in Ub, Tt, Db (Alfisols), Nn (Ultisols) and Sm (Inceptisol), “high” in Wa and Ck (Vertisols) and “very high” available K in Bm1 (Vertisol). Based on profile average, there was a high content of non-exchangeable K $671.63 \text{ mg kg}^{-1}$ and $545.70 \text{ mg kg}^{-1}$ in Ck (Vertisol) and Sm (Inceptisol) respectively. The lowest content of non-exchangeable K was found in Db (Alfisol) (11.76 mg kg^{-1}). The highest reserved K was found in subsoil of Sm compared with that in other soil profiles.

The highest total K with a profile average of 21729 mg kg^{-1} was found in the soil derived from alluvium over marine deposits Sm, while the lowest average of 172 mg kg^{-1} and 176 mg kg^{-1} were found in the soils derived from local alluvium partially derived from limestone, Wa and Bm2 respectively.

The content of available K (soluble K + exchangeable K) was observed from high to low in the order of Vertisols > Inceptisols > Alfisols > Ultisols. However, the total K content in the soils was as follows: Inceptisols > Ultisols > Alfisols > Vertisols. The clay content and organic matter and cation exchange capacity positively and significantly correlated with the soluble K plus exchangeable K in these soils, more than any other soil properties. Non-exchangeable K was significantly correlated with soluble K plus exchangeable K ($r=0.502^{***}$), reserved K ($r=0.635^{***}$) and total K ($r=0.654^{***}$) indicating that different forms of potassium along with organic matter maintenance should be carefully considered for management of potassium fertility in rice production.

Student's signature

Thesis Advisor's signature