

Relationship between Flame Photometry and ICP-MS Detected Potassium Concentrations Extracted in Calcium Chloride for Paddy Soils Samples

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Ammonium acetate extracted and Flame photometry (FP) detected potassium (K) concentration is widely used to determine the exchangeable K in paddy soils. Recently, inductively coupled plasma mass spectrometry (ICP-MS) is also used widely in analytical purposes as it has capabilities of simultaneous determination of major and trace elements. Moreover, calcium chloride (CC) is used as a universal extractant when determining mineral elements in soil samples. However, the relationship between FP and ICP-MS detected K concentrations in CC extracted paddy soil samples of Sri Lanka is not known. Therefore, a total of 250 soil samples were collected from lowland rice paddy fields in Sri Lanka representing all three climatic zones (wet, dry and intermediate). Potassium in 4 g of soil was extracted into 40 mL of 0.01 M CaCl₂ for two hours in an orbital shaker at the ambient temperature and K concentration was determined by FP and ICP-MS methods. The range of K determined by both methods was similar. The concentration of K ranged from 17.84 mg kg⁻¹ to 490 mg kg⁻¹ in the FP method while it was in the range from 0.00 mg kg⁻¹ to 492 mg kg⁻¹ in the ICP-MS method. The mean K concentration detected by the FP method was greater (136±5.98 mgkg⁻¹) than that by the ICP-MS method (64.0±3.95 mgkg⁻¹), indicating lower sensitivity of the ICP-MS method than FP. The relationship between the FP and ICP-MS detected K was $K_{(FP)} = 0.52 \times K_{(ICP-MS)} - 6.64$ with a R^2 value of 0.61 ($p < 0.000$). Therefore, ICP-MS and FP detected K concentrations are interchangeable when determining K concentration in paddy soils extracted using the CC method. Due to the use of soils from a wide range of soils and concentrations, derived relationships are robust.

Keywords: Calcium chloride, Exchangeable potassium, Flame photometry, ICP-MS, Paddy soils

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