Comparison of extraction and detection methods of exchangeable Potassium in paddy soils in Sri Lanka

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Abstract

Extracting potassium (K) with ammonium acetate (AA) and detecting under flame photometer (FP) is widely used to determine the exchangeable K concentration. Moreover, calcium chloride (CC) is used as a universal extractant (simultaneous extraction of many elements) and the concentration of these elements are detected using inductively coupled plasma emission mass spectrometry (ICP-MS). Therefore, this study aimed to examine the relationship between 1 M AA extracted K detected using the FP method and 0.01 M CC extracted K detected using the ICP-MS method. A total of 250 soil samples were collected from lowland paddy fields in Sri Lanka representing three climatic zones and 19 districts. Extraction and detection protocols of K were as mentioned above. Results revealed that the mean exchangeable K detected by ammonium acetate-flame photometer (AA-FP) method was greater (250 ± 9.2 mg kg^{-1}) than the calcium chloride- ICP-MS (CC-ICP-MS) method (64 ± 3.4 mg kg^{-1}). Concentration of K determined by AA-FP method ranged from 34 mg kg^{-1} to 803 mg kg^{-1} while that by the CC-ICP-MS method ranged from 0 mg kg^{-1} to 373 mg kg^{-1}. The relationship between the exchangeable K by the AA-FP method and CC-ICP-MS method was K (CC-ICP-MS) = $0.288 \times$ K (AA-FP) -7.25 with a R^2 value of 0.58 (P<0.001). Therefore, CC-ICP-MS can be used as a reliable and convenient method to determine the exchangeable K in paddy soil in Sri Lanka.

Keywords: Ammonium acetate, Calcium chloride, Exchangeable potassium, Flame photometer, ICP-MS

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