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Comparison of non-exchangeable K release from micaceous minerals using different extractants

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It has been well established that a significant proportion of plant needs for potassium is supplied from non-exchangeable fraction of soil K. The major sources of non-exchangeable K in soil are K-rich 2:1 minerals such as micas and vermiculite. Major micaceous minerals in soils and rocks include muscovite, biotite and phlogopite. This study was conducted to determine the effect of different extracting solutions on the release of K from three micaceous minerals and providing in order to provide basic information for future studies on plant-mica interactions. Mica samples including Biotite, muscovite and phlogopite were collected from the mines in Amlesh (North of Iran) and Hamedan (West of Iran). Mineralogical and chemical characteristics of the minerals were studied by XRD and XRF analysis. Less than 60 micron particles saturated with Ca were used in the experiment. Sequential extraction up to 30 times was performed by 0.1N HCl, 1N NH_4OAc and 0.1N $BaCl_2$ with different mechanisms for potassium extraction. Ratio of Mineral to extractants and time of extraction were 1:5 and 15 minutes, respectively. After each extraction, samples were centrifuged to a clear supernatant liquid that was removed and analyzed for potassium. XRF analysis showed that percentage of total K in Biotite, phlogopite and muscovite was 4.7, 6.8 and 7.4, respectively. There was a significant difference among three extractants in cumulative K released from three minerals. Highest values of cumulative K release were obtained for $BaCl_2$ solution and muscovite mineral. The results also

showed that when 0.1N HCl solution was used for K extraction, cumulative K release after 30 times of extraction was as follows: phlogopite>biotite>muscovite. It was as muscovite>phlogopite>biotite and muscovite>biotite>phlogopite for 1N NaOAc and 0.1N $BaCl_2$ solutions, respectively. In contrary to our expectation, not only K release from muscovite mineral was not less than that from other micaceous minerals, but also, under the conditions of this experiment, K release from muscovite was higher when1N NaOAc and 0.1N $BaCl_2$ solutions were used as extractants.