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Potassium Releasing Capacity in Some Soils of Anantnag District of Kashmir

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Abstract:

The potassium releasing capacity of fifteen soil samples of Anantnag district of Kashmir were assessed by using five chemical extractants. The decreasing order of potassium release by the different chemical extractants in the soils was 1M HNO_3 > 0.01 N HCl.-12 extractions>0.01 N HCl.-9 extractions> 0.3 N NaTPB-16 hours > 0.01N HCl 3 extractions> 1.38N H_2SO_4=0.01N HCl-1 extractions> % K saturation. The K released by 1M HNO_3 was significantly correlated with 1.38N H_2SO_4 (0.995) and 10.28 N H_2SO_4 (0.996**) .The significant correlations among different form of K in Anantnag soils indicate the various K pools (exchangeable=Non-exchangeable) for proper K fertilizer management. The potassium status in Anantnag soils was variable.**

Keywords: Extractants, Fertilizer, Potassium, Soil quality

1.0 Introduction:

Potassium releasing and supplying power of the soil are often used as synonyms. A knowledge of the rate of potassium release from soil might play an important role for comparing capacities of soil to supply potassium to plants (Srinivasrao *et al*., 2001). The release of non- exchangeable potassium occurs when the levels of exchangeable K and soil solution K are decreased by crop removal and leaching. No work has been reported so far on the suitability of various K test procedure for their suitability to measure K release from Anantnag district soils of Kashmir.

The number of studies have been previously carried out regarding the evaluation of K releasing methods in various ecological and groups of soils using different test crops (Yadav,1983,Patiram and Prasad,1991 and Singh 1995) .A critical appraisal of the results of carried out investigations indicate that no methods has been found appropriate under all situations /locations. This is because of wide variation in the soil, type of plant and experimental techniques. The similar studies have been carried out for knowing variability in potassium forms in different soils and their capacity to release the same by Subhash Chand *et.al (*2009) and Subhash Chand,2010.

2.0 Materials and Methods:

Present investigation has been carried out under RCM project to assess the potassium releasing capacity of soils, different forms of K and correlations among K releasing methods and different forms. Fifteen composite bulk surface soil samples (0-15 cm) in triplicate representing fifteen dominant soil associations/locations were collected from the farmers field on the basis on cultivable soils of farmers field. Soil samples were air dried and passed through 2 mm sieve. The pH, electrical conductivity, and cation exchange capacity and particle size distribution of soils were determined following standard analytical methods. The K releasing methods were given below.

2.1 Sodium tetra phenyl boron method (NaTPB): In this method the potassium extracted by NaTPB at two intervals (15 minutes and 16 hours as suggested by Schutte and Correy (1965). The property of this reagent is to remove from the solution K^+ ions released by Na^+ which otherwise would block the further release potassium from the inter layer sites.

2.2 Hot Nitric acid methods (1M HNO_3): Five gram soil sample was left to stand over night with 50 ml 1M HNO_3 then boiled gently for 15 minutes as reported by Haylock, 1956.

2.3 Sulphuric acid methods: These are simple to use since an exact quantity of heat energy is furnished to

all the soil extraction system. The different concentration like 1.38 N H_2SO_4 and 10.28 N H_2SO_4 as per suggested by Hunter and Pratt, 1957 are used for extraction of potassium.

2.4 Step extraction method: Volume of cumulative extraction were calculated by adding amount of K extracted in each step and reported as contant -K and step-K as modified by Pal and Mukhopadhyay in 1992.

2.5 ***Per cent K Saturation:*** The value of per cent saturation is mainly governed by the mineralogical make up and soil texture. It is estimation by calculation.

3.0 Results and Discussions:

Table 1: Coefficient of Correlation in Different Forms of K in Some Soils of Kashmir

Forms-K	Water Soluble-K	Exchangeable -K	Available-K	Non Exchangeable-K	HNO_3 -K	Lattice-K	Total-K
Water soluble-K	1.000	0.644**	0.843**	0.286	0.562*	0.286	0.453*
Exchangeable -K	0.644**	1.000**	0.953**	0.500*	0.766**	0.500*	0.665*
Available-K	0.843**	0.953**	1.000**	0.467*	0.761**	0.467*	0.648**
Non Exchangeable -K	0.286	0.500*	0.467*	1.000	0.929**	1.000**	0.976**
HNO_3-K	0.562*	0.766**	0.761**	0.929**	1.000**	0.929**	0.987**
Lattice-K	0.286*	0.500*	0.467**	1.000**	0.929**	1.000**	0.976**
Total-K	0.453*	0.665**	0.648**	0.976*	0.987**	0.976**	1.000**

*** Significant at the 0.01 level and *0.05 level*

Table 2: Correlations among Different K Releasing Methods in Some Soils of Kashmir

					0.01HCl Step extraction				
					1	3	9	12	
0.3 N-NaTPB	1.000	-0.239	-0.178	-0.178	-0.134	-0.134	-0.142	-0.142	-0.402
IM HNO_3	-0.239	1.000**	0.995**	0.995**	0.270	0.270	0.267	0.267	0.439
1.38N H_2SO_4	-0.178	0.995**	1.000**	1.000**	0.241	0.241	0.240	0.240	0.430
10.28 N H_2SO_4	-0.178	0.995**	1.000**	1.000**	0.241	0.241	0.240	0.240	0.430
0.01HCl Step extraction (1)	-0.134	0.270	0.241	0.241	1.000**	1.000**	0.998**	0.998**	0.113
0.01HCl Step extraction (3)	-0.134	0.270	0.241	0.241	1.000**	1.000**	0.998**	0.998**	0.113
0.01HCl Step extraction (9)	-0.142	0.267	0.240	0.240	0.998**	0.998**	1.000**	1.000**	0.125
0.01HCl Step extraction(12)	-0.142	0.267	0.240	0.240	0.998**	0.998**	1.000**	1.000**	0.125
% K Saturation	-0.402	0.439	0.430	0.430	0.113	0.113	0.125	0.125	1.000**

*** Significant at the 0.01 level and *0.05 level*

The mean and range of pH was 6.16 (5.73-7.91), EC (ds/m) 0.16 (0.30-0.88), OC (%) 1.93 (0.91-3.71), available N (kg/ha) 376 (295-580), P_2O_5 22.8(12-45) and K_2O 86 (67-117). The mean and range of different forms of K (meq/100 g soil) were WS –K 0.075 (0.012-0.181), Exchangeable-K 0.303 (0.191-0.562), Available -K 0.381 (0.155-0.743) ,HNO_3 -K 1.638 (1.121-2.672) , Non-Exchangeable-K 1.256 (0.964 -01.929), Lattice-K 1.258 (0.872-1.929) and Total -K 2.894 (1.993-4.601). The various forms of K was found in dynamic, indicates various K pools. The correlations among different forms of K and releasing method/s are given in table 1. Indicates that total-K showed positive significant correlation with water soluble-K, available-K, non-exchangeable-K and lattice-K. Subhash Chand and Dudi (2001) also reported similar results.

Similar trends indicate that forms of potassium were dynamic and reflect dependence on each other. The similar results were recorded by Subhash Chand in 1997 and 2010 while working on different forms of K at Udaipur, Rajasthan on different soil associations of Bharatpur soils. The potassium releasing power of Anantnag soils were assessed by different K releasing methods and found positive significant correlations among different methods as described in table 2. The soils were found variable in K releasing power as ascribed due to different mineralogical make up, climatic conditions, and cultivation and fertilizer practices. The temperate region soils like soils of Kashmir showed slow releasing pattern of potassium and dominated by 2:1 type clay minerals.

4.0 Conclusions:

The Anantnag district soils were found variable in their K releasing power. The hot 1M HNO3 was found most suitable extractants on the basis of their concentration used, time consumed in extractions, coefficient of correlation with other extractants and soil properties.

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References:

1. Haylock, O.F. (1956): A Method for Estimating the Availability of Non- exchangeable Potassium Transactions 6th International Congress of Soil Science, 1:403-408.
2. Hunter, A.H. and Pratti, P.F. (1957): Extraction of Potassium from Soils by Sulphuric Acid. Proceedings of Soil Science Society of America, 21: 594-598.
3. Partiram and Prasad, R.N. (1991): Release of None-exchangeable Potassium and its Relation to Potassium Supplying Power of Soils. Journal of the Indian Society of Soil Science.39:488-493.
4. Pal, S.K. and Mukhopadhyay, A.K. (1992): Potassium Releasing of Soils as a Tool to Assess its Sypplying Power. Journal of the Indian Society of Soil Science, 40:266-270.
5. Schulte, E.E. and Corey, R.B. (1965): Extraction of Potassium from Soils with Sodium Tetraphenyl Boron. Proceedings of Soil Science Society of America Proceedings, 29: 33-35.
6. Shrinivasrao, C., Subbarao, A., and Rupa, T.R. (2001): Need for Inclusion of Non- exchangeable Potassium as a Measure in Soil Test Calibration and Potassium Recommendations. Fert. News, 46: 31-38.
7. Singh, R.K (1995): Potassium Fertility Characterization of Two Soils Series of Rajasthan .PhD Thesis. Rajasthan Agriculture University,Bikaner.pp212.
8. Subhash Chand (1997): Potassium releasing characteristics of some important soil associations of Bharatpur district of Rajasthan. MSc Thesis, Rajasthan College of Agriculture, Udaipur.pp210.
9. Subhash Chand, Tahir Ali and N.A. Kirmani (2009): Potassium Releasing Power of some Anantnag district soils of Kashmir. Poster paper presented in 9 th Agriculture Science Congress held at SKUAST-K, Shalimar pp24.
10. Subhash Chand (2010): Assessment of Potassium Release by Different Chemical Extractants in Soils of Eastern Rajasthan. Journal of Research, SKUAST-J, 9:1:108-113.
11. Subhash Chand and D.P.S. Dudi (2001): Assessment of Potassium Release by Exhaustive Cropping with Oat (*Avena sativa*). 66th Annual Convention of ISSS Abstracts.152.
12. Yadav,B.S. (1983): Relative Crop Response and Redefining of Critical Limits of Potassium in Red soils of Critical Limits of Potassium in Red Soils of Rajasthan. PhD Thesis. Univ. of Rajasthan, Udaipur.