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FIXATION OF POTASSIUM IN SOILS AS AFFECTED BY REMOVAL OF ORGANIC MATTER BY H_2O_2 TREATMENT

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Abstract

Effect of organic matter removal by 30 percent H_2O_2 treatment on potassium fixation was studied with six Bangladesh soils with varied mineralogical composition. It was found that the removal of organic matter caused an increase in potassium fixation from 3.07 to 44.94 per cent over the untreated soils except in one.

Introduction

Addition of organic matter to soils has been found to decrease the fixation of added potassium (Zolotaev and Boktor 1973). On the other hand, it is considered that the removal of organic matter would consequently increase potassium fixation (Karim and Malek 1956). The increase is thought to be due simply to reduction in competition for potassium ions between mineral and organic exchange sites (Chaudhury 1967). With a view to verify the statement, potassium fixation was studied by destroying the native soil organic matter with 30 per cent H_2O_2.

Materials and Methods

12 samples of six representative Bangladesh soils were included in the study (Table 1). These samples represented the soils at two depths (0-6″ and 6″-12″ from surface) of the six soils. The removal of organic matter was carried out with the addition of 75 ml of 30 per cent H_2O_2 to 25 mg soil and heating the soils on water bath at temperatures of 70-75°C until frothing stopped. This treatment was effective in removing major portions of soils organic matter (Table 1). The H_2O_2 treated soils were then dried in an oven at 105°C. To 10 g each of these was added 10 ml of KCl solution containing 125 ppm of K. The fixation of potassium was made by following Volk's (1934) method as described by Jackson (1958). The amount of potassium fixed by the soils are shown in Table 1.

Table 1. The physical and chemical properties of the the soils, amount of O.M. removed after 30% H_2O_2 treatment and fixation of potassium.

Soils (series)	Depth inches	pH	Texture	Clay Minerals	O.M %	O.M. removed %	Amount K fixed in untreated soils lbs/A	Amount K fixed after O.M. removal lbs/A.
Noadda	0-6	6.6	loam	IKH	1.19	83.19	119.93	232.40
	6-12	6.3	clay loam	IKH DI	0.80	78.75	90.80	189.82
Borda	0-6	5.2	clay loam	IK HMV	1.82	75.88	102.33	138.50
	6-12	6.3	clay loam	IK HMV	0.71	76.06	101.80	149.00
Khilgoan	0-6	4.8	clay	K HMH	3.40	79.41		
	6-12	4.9	clay	KH MH	1.79	88.83		
Tejgaon	0-6	5.7	clay loam	KI	1.74	86.79	28.93	37.40
	6-12	5.5	clay	KI	1.11	88.29	53.53	61.20
Demra	0-6	7.0	clay	IKM	1.87	80.30	78.53	97.60
	6-12	6.6	clay	IKM	1.32	78.08	44.87	96.00
Fatki	0-6	7.7	clay	IKV	1.51	48.39	110.80	172.20
	6-12	8.2	clay	IKV	0.89	64.04	66.93	196.20

I=Illite ; M=Montmorillonite ; V=Vermiculite ; K=Kaolinite ; H=Halloysite ; DI=Degraded illite ; MH=Meta halloysite : HM=Hydrous mica (Rashid 1976).

Results and discussions

A study of Table 1 indicates that the removal of organic matter increased the fixation of added K in all the soils except in the soils of the Khilgaon series. Highest amount of fixation was noticed in the surface soil of the Noadda series the amount being 92.96 per cent of the added potassium. The increase in K fixation in this soil was 44.94 per cent over the untreated soil. Slight increase in fixation was observed in the sub-surface soil of the Tejgaon series, the amount being 3.07 per cent. Among the other soils which showed a marked increase in K fixation were surface and sub-surface soils of the Borda and Fatki series, and the sub-surface soil of Noadda series (Table 1). With the exception of the Khilgaon series soil, the other soils showed an increase of 22.88 per cent in fixation on average after the removals of organic matter. Increase in the fixation of added potassium with the amount of organic matter removal was found to be associated with the nature of the clay minerals. Karim and Malek (1956) observed an increase of 27.6 per cent K-fixation after organic matter removal by H_2O_2 treatment with some Bangladesh soils (the then East Pakistan). Similar study was made with ammonium

fixation by Hinman (1966). He found that treating soils with H_2O_2 destroyed large amount of organic matter and increased ammonium fixation. This is analogous to the following statement "Organic matter has a large cation exchange capacity of about 200-300 me per 100g and, therefore, its removal might also increase fixation of potassium simply due to a reduction in competition for potassium ions between mineral and organic exchange sites" (Chaudhury 1967).

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