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INFLUENCE OF LIMING ON THE EXCHANGEABLE POTASSIUM OF TWO ACID SULPHATE SOILS OF KERALA

S. KABEERATHUMMA and C. C. BIDDAPPA

Central Rice Research Institute, Cuttack-6

Liming in relation to availability of potassium has engaged the attention of large number of workers. However contradictory experimental results were obtained on this aspect (Mackay and Mac Eachern, 1962). Information on the progressive changes of exchangeable potassium with lime at different levels of lime appears to be meagre. Hence a study was undertaken to examine the influence of different levels of lime (CaO) on the exchangeable potassium and its subsequent changes with time in two acid sulphate soils of Kerala.

Materials and Methods

Representative samples of two acid sulphate soils viz., Kan and Karapadam were collected for this purpose. These soils were analysed for their pH, lime requirements (Hutchinson & Mac Lennan, 1914) and exchangeable bases. An incubation experiment was carried out in pots with graded doses of lime (O, $\frac{1}{2}$ LR and Ful LR) with 2.5 cm of standing water above the soil level maintained throughout the experimental period. At periodical intervals (15th, 45th, and 75th days after liming) soil samples were analysed for their exchangeable potassium N NH_4 OAC (Jackson, 1958). Simultaneously under identical conditions in another set of pots were grown paddy variety culture-28. Soil samples were drawn from these pots after harvest and analysed for exchangeable K. The results were analysed for its statistical significance.

Results and Discussion

The general nature of the soils is given in Table 1 and results are presented in figures I and II.

It is seen from the table that these two soils vary widely in their lime requirements. The Kari soil being strongly acidic had a lime requirement value twice that of Karapadam soil. The Kari soil (Fig 1) where the application of lime (CaO) was made atthe rate of 7.6 and 15.3 tonnes/acre indicated that the exchangeable K is more in the unlimed soil followed by L_1 & L_1 treatments at 15th day of extraction. A similar trend is maintained through out (45th and 75th day) except for the magnitude of the absolute values. The exchangeable K appeared to be decreased considerably with the application of lime upto 75th day indicating that part of

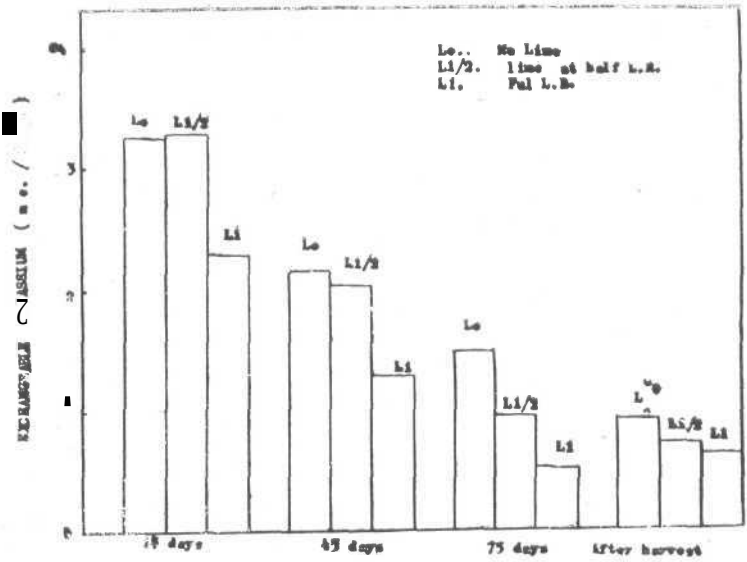

Fig. 1. CHANGES OF EXCHANGEABLE POTASSIUM WITH TIME AS INFLUENCED BY THE LIME APPLICATION IN KARI SOIL.

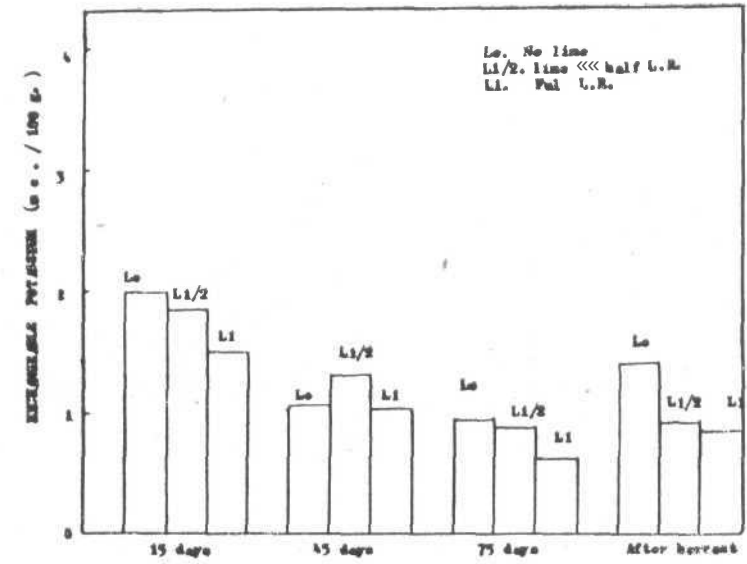

Fig. 11. CHANGES OF EXCHANGEABLE POTASSIUM WITH TIME AS INFLUENCED BY THE LIME APPLICATION IN KARIANDUSI SOIL.

Table 1

Chemical composition of soils used in the study

Chemicals constituents	Kari soil	Karapadam soil
pH (1 : 2.5 soil water suspension)		5.0
Lime requirement (Hatchinson and MacLennan method)	15.3 tons of $CaCO_3$ /acre	7.7 tons of $CaCO_3$ /acre
Exchangeable potash	0.1 me/100 g soil	0.3 me/100 g soil
Cation exchange capacity	31.2 me/100 g soil	20.6 me/100 g soil
Exchangeable hydrogen	25.7 me/100 g	14.6 me/100 g
Exchangeable calcium	2.90 me/100 g	2.40 me 100 g
Exchangeable magnesium	1.76	3.0 me/100 g

exchangeable potassium might have been converted immediately into nonexchangeable forms. It is seen from the Fig. 1 that the decrease is considerably high between the 45th to 75th day. Further decrease of exchangeable potassium is only moderate as is evidenced by the data obtained after harvest. It indicates that the major portion of available K on application of lime is convened into nonexchangeable forms in 75 days. Lime, at half the lime requirement dose, is not able to decrease the available K content to the same extent as is done by lime at full lime requirement dose.

From the figure II it is clear that the pattern of changes in available K with application of lime in Karapadom soils is similar to the pattern discussed in respect of Kari soils. The exchangeable potassium progressively decreases with time of incubation and the different, levels of lime show a definite influence on the exchangeable potassium. Similar results have been obtained by MacKay and MacEachern, 1962.

There are various experimental results to show that the increased application of lime to the acid soils would enhance K fixation and thus decrease its content in the exchangeable from (Evans and Attoe 1948). The decrease in ex. changeable K in these two soils has been mainly attributed to the fixation of potassium resulting from liming the soils. In this context it has to be recognised that the ratio of exchangeable Ca: K. of the original soil is the most important factor in deciding the magnitude of decrease of exchangeable K due to the application of lime to acid soils. Although the process of liming aims at the amelioration of soil acidity and soil environment for better plant growth, it may also have an

adverse effect on the concentration of exchangeable soil potassium. Probably it is presumed that the decrease in the K held in planar exchange sites would have been squeezed into the interlattice positions which are not as easily exchanged as those held at planar exchange sites (Powell and Hatcheson 1965).

Summary

Two typical acid sulphate soils of Kerala were employed in this study to investigate the influence of liming at different levels (which was used as an amendment to correct the soil acidity) on the exchangeable potassium with progress of time. It was noticed that the exchangeable potassium was continuously decreased upto 75th days in both the soils and in all the treatments. However when lime was applied at the rate of full lime requirement dose the decrease of the exchangeable potassium was very marked. This probably may be due to conversion of the exchangeable potassium initially to nonexchangeable forms. Thus liming enhanced the fixation of potassium in these soils.

സംഗ്രഹം

വിനിമയ യോഗ്യമായ പൊട്ടാസ്യത്തിന്മേൽ വ്യത്യസ്ത അളവുകളിലുള്ള കുമ്മായ പ്രയോഗത്തിന്റെ കാലക്രമത്തിലുള്ള സ്വാധീനതയെപ്പറ്റി പഠനം നടത്തുന്നതിനു വേണ്ടി കേരളത്തിലെ രണ്ട് പ്രാരൂപിക അമ്ളസംഘോറ് മണ്ണുകളെ ഉപയോഗപ്പെടുത്തുകയുണ്ടായി. രണ്ടു തരം മണ്ണുകളിലും വിനിമയ യോഗ്യമായ പൊട്ടാസ്യത്തിന്റെ അളവ് 75-ാം ദിവസം വരെ അനസ്യൂതം കുറഞ്ഞുവരുന്നതായി കണ്ടു. പൂർണ്ണമായ തോതിൽ കുമ്മായം ചേർത്തപ്പോഴാണ് ഈ കുറവ് ഏറ്റവും പ്രകടമായി കണ്ടത്. ഇതു് ഒരു പക്ഷെ വിനിമയയോഗ്യമായ പൊട്ടാസ്യം ആരംഭത്തിൽ വിനിമയയോഗ്യമല്ലാത്ത രൂപത്തിലേക്ക് തരം താഴ്ത്തപ്പെടുന്നതു കൊണ്ടാകാം. ഇതിൽനിന്നും കുമ്മായം ചേർക്കുന്നതു കൊണ്ട് ഇത്തരം മണ്ണിൽ പൊട്ടാസ്യത്തിന്റെ go ധ്ക്കൽ (യൗഗീകരണം) കൂടുതലാകുമെന്നു മനസ്സിലാക്കാം.

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