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Impact of Lime on Rice Yield and Available Potassium in Coastal Acid Soils of Karnataka

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Abstract : *The field experiment with liming to acid soils having pH 5.2 was conducted for two consecutive years (1986 and 1987). It was recorded that the lime application has significant effect in increasing paddy yield and also increasing the availability of potassium during crop growth. The maximum increase in yield was 23 per cent over the control. The application of lime more than 75 per cent of lime requirement, was found to be more beneficial. The lime requirement value was computed to 4500 kg ha^{-1}. (**Key word** : Lime requirement, soil capacity, soil neutralisaiton, k-availability)*

In India, acid soils are distributed practically in all the states. In Karnataka, they are common in the two coastal districts : Dakshina Kannada and Uttar Kannada. Paddy is the main crop grown in Dakshina Kannada district in all the three cropping seasons of the year covering an area of more than two lakh hectares. The crop yield is generally observed low. This is because of the soil acidity and low exchangeable bases. In view of this, it is imperative to study the effect of liming on crop yield in acid soils of Karnataka. Under acidic conditions the availability of many plant nutrients both from the soil and from applied fertilizers, is considerably affected. Amelioration of these soils is achieved by neutralising or atleast reducing soil acidity usually by liming.

MATERIAL AND METHODS

The field experiment was conducted during 1986 and 1987 at Agricultural Research Station, Kankanady, Mangalore, Dakshina Kannada. Soils have sandy clay loam texture with pH 5.2 and available potassium 40 kg ha^{-1} . Considering the soil pH, the lime requirement (LR) was determined (Shoemaker *et al.* 1961), to be 4500 kg ha^{-1} The area of experimentation was laid out into 24 subplots (5m x 3m each) to accommodate six treatments with four replications. The cultivation of paddy (Shakti-IET3232) was done according to the recommended practices. 33 per cent of nitrogen (urea) full dose P (super phosphate), and 50 per cent of potassium (muriate of potash) were applied just before transplanting of 20 days old seedlings at 20 X 10 cm spacing. The remaining quantity of fertilizers were applied at the tillering and panicle initiation stages. At maturity the yield was recorded and statistical test was applied.

RESULTS AND DISCUSSION

There is an increasing trend in grain yield (Table 1) with increase in the magnitude of lime application. Lime applied at 100 per cent lime requirement (LR) values, has given the highest yield as compared to all other treatments during both the years. (53.8 and 57 qha^{-1}). The increase in yield from 42.7 to 53.8 during 1986, and from 49.2 to 57.0 qha^{-1} /q during 1987 are substantial. (Fig. 1) The pooled analysis indicated that the treatmental effects in both the years were highly significant with regard to grain yield. The increase in grain yield over control is from 3.2 to 20.6 per cent. Significant response to lime application in paddy was also reported by Ananthanarayana and Perur (1973).

It could be further seen that the content of available potassium increases at tillering stage from 35.6 to 67.9 kg ha^{-1} during 1986 and from 45.8 to

TABLE 1. Effect of lime on grain and straw yield (q ha^{-1}) of paddy

Treatement	Grain yield			Straw yield		
	1986	1987	Mean	1986	1987	Mean
T_1 (Control)	42.7	49.2	45.9	31.3	33.5	32.4
*T_2 (500 kg) lime ha^{-1}	42.9	51.9	47.3	34.3	34.2	34.3
T_3 (100% LR)	53.8	57.0	55.4	32.5	42.4	37.5
T_4 (75% LR)	50.7	54.5	52.6	36.6	39.3	38.3
T_5 (50% LR)	47.4	53.7	50.6	37.1	39.2	38.1
T_6 (25% LR)	47.6	53.1	50.4	32.5	38.5	35.5
S.Em.±	0.92	1.40		1.48	1.10	
CV (%)	3.86	5.30		8.70	5.60	
CD (0.05)	2.77	4.30		NS	3.20	

* Farmers practice

LR (lime requirement) at 100% works out to 4500 kg ha^{-1} lime

Low straw yield is due to untimely rains affecting the straw, kept for drying.

TABLE 2. Effect of lime on available potassium (kg ha^{-1}) during growth stages of paddy

Treatment	Tillering		Paincle initiation		Maturity	
	1986	1987	1986	1987	1986	1987
T_1 (Control)	36.6	45.7	34.6	42.5	31.1	43.0
*T_2 (500 kg) lime ha^{-1}	42.8	51.0	46.0	52.5	44.2	48.5
T_3 (100% LR)	67.8	62.0	70.8	61.0	64.1	59.5
T_4 (75% LR)	63.5	58.5	65.8	56.0	61.1	56.0
T_5 (50% LR)	55.8	55.5	58.6	55.5	56.6	52.0
T_6 (25% LR)	50.2	54.5	53.2	52.5	51.3	51.2
S.Em.±	0.52	1.04	0.41	1.77	0.89	1.11
CV (%)	1.97	3.82	1.48	6.67	3.47	4.37
CD (0.05)	1.56	3.14	1.22	5.34	2.69	3.36

* Farmers practice

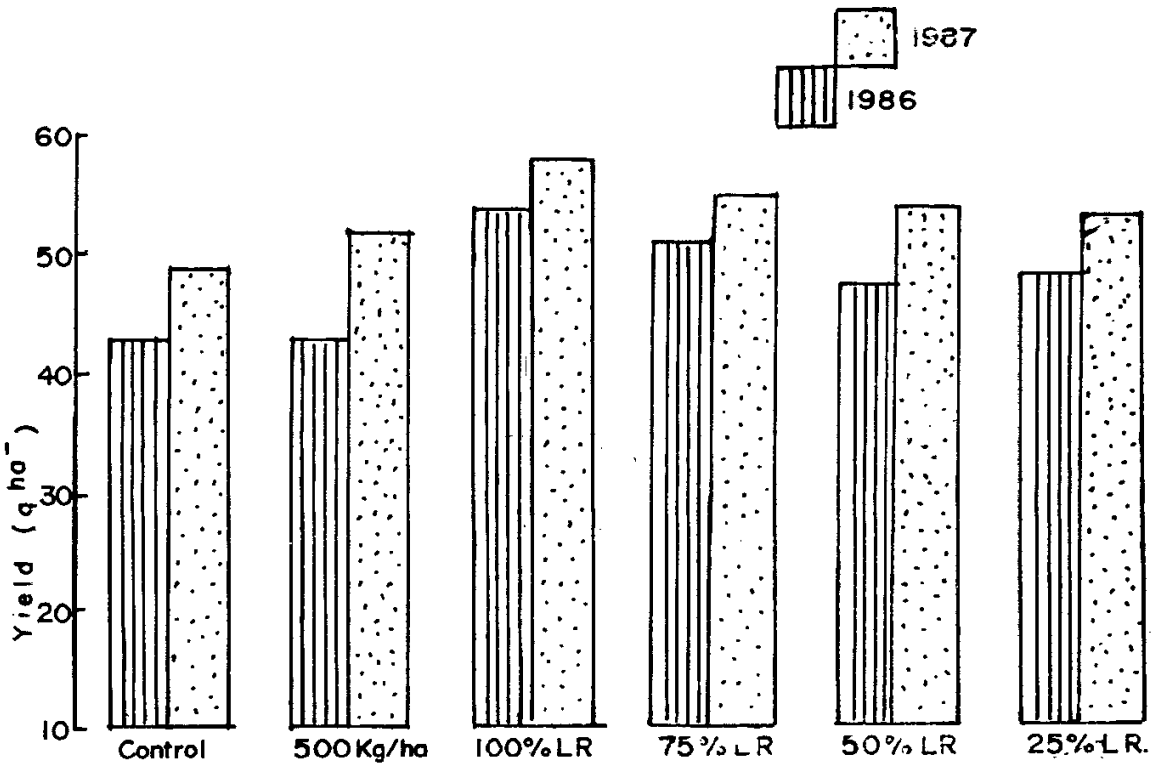

Figure 1. Effect of the levels of lime on grain yield during 1986 and 1987

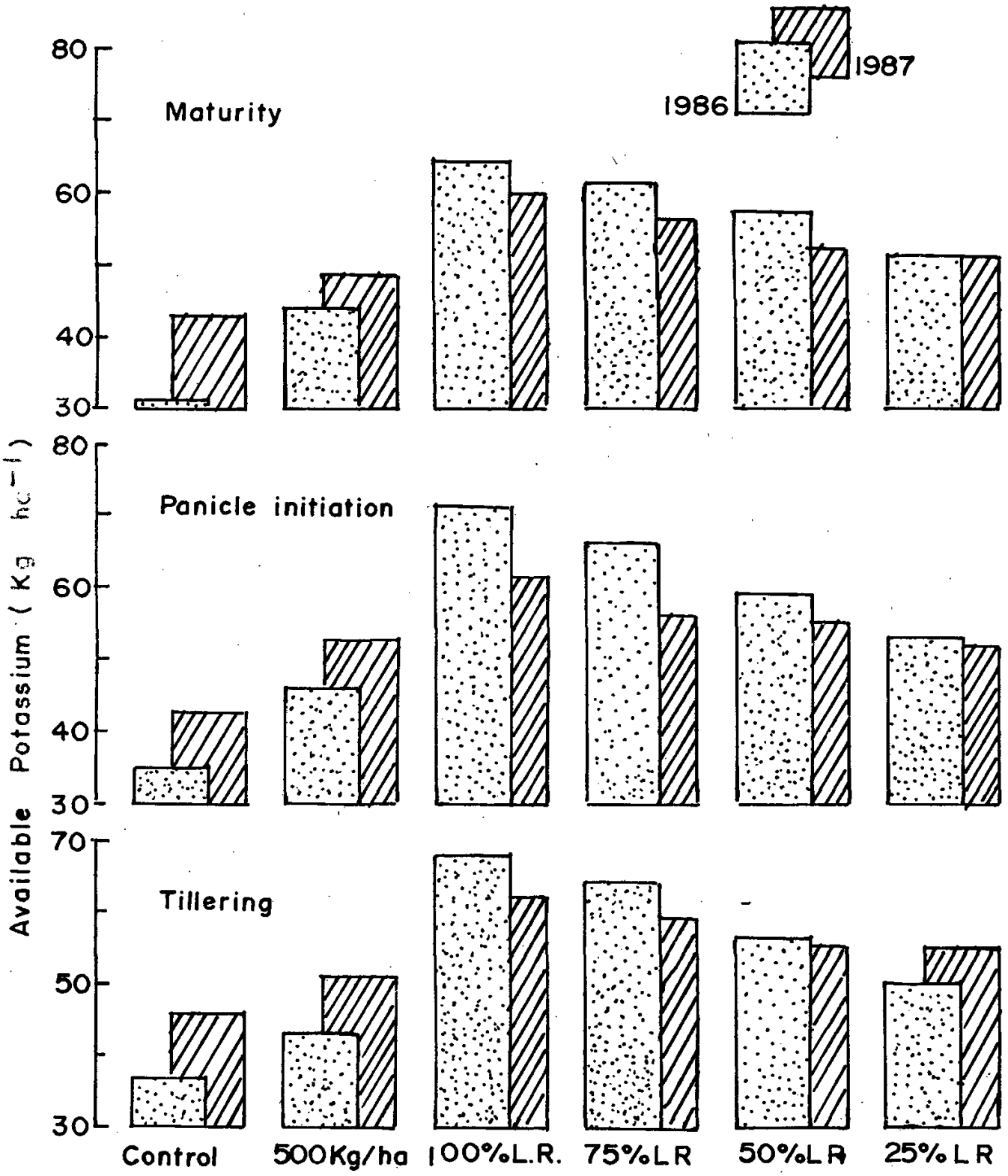

Figure 2. Effect of the levels of lime on available Potassium at growth stages of paddy

62.0 kg ha^{-1} during 1987. At the panicle initiation stage, the increase was from 34.6 to 70.9 kg ha^{-1} during 1986, and from 42.5 to 61.0 kg ha^{-1} during 1987. At maturity, the increase was from 31.1 to 64.1 kg ha^{-1} during 1986, and from 43.0 to 59.0 kg ha^{-1} during 1987. The pooled data reveals the statistical significance for the levels of available potassium due to the treatments effect at all the growth stages of paddy (Fig. 2).

Such an increase in available potassium may be attributed to the release of K from non-exchangeable fraction. The available pool of K gets accelerated when acid soils are treated with lime (Kemprath & Fay 1971). Similar increases in available potassium statusdue to the application of lime at different levels were reported by Bishnoi *et al.* (1988). The lime application neutralizes the aluminium in inter layers of clay minerals, as a result of which, an increase in cation exchange capacity is expected in inorganic colloids and thereby K-selective binding sites, thus resulting increase in lable pool of available potassium (Nemeth 1975). Patiram and Rai (1988) working on the effect of liming on potassium in acid soils of Sikkim also recorded similar observations with lime application.

Thus it is seen that liming to acid soils increases potassium availability and thereby increases the yield.

REFERENCES

Ananthanarayana, R. & Perur, N.G. (1973) Effect of liming on the yield attributes of paddy. *Mysore J. agric. Sci.*, **7**:35 3-56.

Bishnoi, S.K., Tripathi, B.R. & Sharma, P.K., (1988) Studies on liming of acid soils of Himachal Pradesh. *J. Indian Soc. Soil Sci.*, **36**:257-263.

Kemprath, E.J. and Foy, C.D. (1971) *Fertilizer Technology and usage*, Soil Sci. Soc. Am., Madison, Wisconsin, U.S.A.

Nemeth, K. (1975) The effect of K fertilization and K removal by Rye grass in pot experiments on the K concentration of the soil. *Pl. Soil* **42**:97.

Patiram & Rai, A.N., (1988) Effect of liming on quantity-intensity parameters of potassium in some acid soils. *J. Indian Soc. Soil Sci*, **96**:194-196.

Shoemaker, H.B., Melean, E.O. & Pratt, P.F., (1961) Buffer methods for determining lime requirement of soils with appreciable amounts of aluminium. *Proc. Soil Sci. Soc. Am.*, **50**:1236-40.