

The Response of Rice to Lime and Potash Manuring in South Kanara

by

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Introduction : Rice is the most important crop of South Kanara forming 70% of the total area sown and occupying about 5.6 lakhs of acres. The heavy annual rainfall of over 150 inches received within a short spell of four months subjecting the soil to a constant process of leaching, the slopy situation of the land, high temperature and humidity, all have contributed to the extremely low fertility status of the soil of this tract. As such the yield of not only rice but also most of the other food crops has been miserably low.

As is well known the adequate manuring of field is an all-important factor in rice production and phenomenal yields have been recorded by adequate manuring in recent years. An average rice crop removes about 28 lb. N, 20 lb. P₂O₅ 60 lb. K₂O and 28 lb. CaO and if normal crop production is expected year after year it is quite but natural that these nutrients have to be supplied in adequate quantities. Of the three major plant nutrients namely nitrogen, phosphoric acid and potash the response of paddy to nitrogen has been universal. Though the response with phosphoric acid fertilizers has been somewhat variable it is being widely used in all rice growing countries. Although potash is not widely used for paddy except in Japan, response to this plant nutrient has been reported from a number of countries.

It is generally believed that potash manuring is not needed for Indian soils mainly due to the fact that soil analysis shows fairly large quantity of the same. In South Kanara there exists the common practice of applying liberal quantities of ash to paddy as well as to all other crops. Besides ash, they also use burnt earth or '*Sudumannu*' in large quantities to nurseries, vegetable crops etc. In Malabar also wood ash is applied economically for upland rice, in dry nurseries and for broadcast rice in wet lands.

An important factor in maintaining high productivity in rice soils is the base status and pH of the soil. Application of lime has to be considered as the back bone of good crop production in all humid regions where leaching removes lime from the soil. Chemical analysis reveals a decidedly acidic reaction and a low lime status in

the soil of South Kanara and addition of lime to this soil at fairly high levels has already been proved beneficial. But the cost of lime at such high levels is so prohibitive that it is out of proportion to the advantage gained. Having known the beneficial effects of lime it will be worth-while to find out the response of paddy to lime at lower levels. An observation trial was therefore laid out at the Paddy Breeding station, Mangalore to find out how far paddy responds to application of potash and lime at lower levels.

Review: Mukherjee H. N. and Sinha P (1953) found that potash in combination with nitrogen and phosphoric acid could increase the yield of paddy by two to three maunds per acre in almost all soil types of the Bihar State. In Assam potash significantly increased the yield of paddy not only in the year of application but also left a good residual effect. In China the response to potash was greatest on acid sandy loam and alluvial soils and least on alluvial soils. In Malabar in the case of transplanted swamp rice some yield increase has been recorded by wood ash application. Application of potash was also found to confer some resistance against stem rot, helminthosporium and blast in some centres though in Madras potassium sulphate and super phosphate either alone or in combination with nitrogen was found to have no effect. In water culture application of potash 35 to 45 days before heading increased the number of grains and weight of 1000 grains. In Japan one third of N, P and K is applied dry before puddling and the remainder in two portions three to four weeks after transplanting and two to three weeks before ear emergence. It is also reported that potash deficiency symptoms occur in soils which according to analytical data were well provided with all nutrients. Besides, potash has been found to be complementary to nitrogen, the latter increasing leaf's size and the former its efficiency. Potash also increases the plant's resistance to drought.

The results of the experiment with lime conducted at the station showed that application of lime at doses of 1000 to 3000 lb. per acre results in increased grain yields. Small applications of lime proved more effective per unit used than large doses, lime leaching losses increasing roughly in proportion to the quantity applied. Besides smaller applications were found to bring about greater pH change and larger crop response per unit of lime applied than heavier applications. Lime has also the indirect beneficial effect in that it speeds up the mineralization of organic matter and thus makes nitrogen available to the paddy crop. Heavily leached

soils of North Auckland were found to show response to potash only when the lime and phosphate content of the soil has been built up.

Experimental: An observational trial was laid out with two treatments, one the usual farm manuring consisting of 5000 lb. of leaf and 150 lb. of super phosphate both applied as basal dressing and 30 lb. nitrogen as Ammonium sulphate applied in two equal doses one three weeks after planting and the other six weeks after planting and the other treatments consisting of the application of 100 lb. lime and 15 lb. potash in the form of muriate of potash over the normal farm manuring. Lime was applied 10 to 12 days before planting and potash in two split doses, half at planting and the other half six weeks after. The trial was conducted during both the first and second crop seasons of 1955-'56. During both the seasons of trial all the quantitative factors contributing for yield like number of productive tillers, length of panicle, number of grains per panicle, number of chaff per panicle, length, breadth and thickness of grain and weight of 1000 grains were recorded in both the treatments. The economics of application of the ingredients was also worked out during both the seasons. The data are presented below :

Particulars (mean)	I crop 1955 - '56 Variety: MGL. 3		II crop 1955 - '56 Variety: PTB. 20	
	Farm manuring	Farm manuring + 100 lb. lime + 15 lb. K ₂ O	Farm manuring	Farm manuring + 100 lb. lime + 15 lb. K ₂ O
Tillers (1 month after planting)	5.6	9.1	6.7	9.2
Height (")	33.6"	38.5"	24.2"	28.4"
Tillers (after flowering)	3.3	4.4	4.1	4.8
Height (")	61.1"	64.8"	35.3"	36.2"
Length of panicle	20.0 cm.	21.9 cm.	13.6 cm.	15.4 cm.
No. of grains/panicle	82.6	86.0	63.5	65.1
No. of chaff/panicle	12.4	12.1	8.8	5.5
Length of grain	7.80	8.30	7.95	8.18
Breadth of grain	3.10	3.10	2.98	2.99
Thickness of grain	2.20	2.30	2.01	2.15
Weight of 100 grains	27.92 grms.	28.64 grms.	26.75 grms.	27.39 grms.
Acre yield of grain in lb.	2454	2695	2184	2312
% increase	100	109.8	100	105.8
Value of extra produce - Rs.	..	26-11-0	..	14-3-6
Cost of 100 lb. lime and 25 lb. muriate - Rs.	..	7-2-0	..	7-2-0
Net profit per acre - Rs.	..	19-9-0	..	7-1-6

Discussion : From the table it is seen that application of lime and potash has increased the yield by 9.8% and 5.8% during the first and second crop seasons respectively. The number of tillers and height both one month after planting and after flowering, length of panicle and number of grains per panicle are more in plots receiving lime and potash. The size of grain especially length and thickness and weight of 1000 grains has been found to be increased by the application of lime and potash, an effect noted to be brought about by the application of potash alone. It was also interesting to note that during the crop growth in the first crop season plants in plot receiving farm manuring alone started lodging about ten days in advance than those in the other plot. Besides it is also seen that the application of these two manurial ingredients has got definite economic advantage also.

The fact that the heavily leached soils of North Auckland showed response to potash only when the lime and phosphoric acid content of the soil was sufficiently high may be one of the reasons for the poor response of potash so far obtained in the lateritic soils of West Coast which are highly deficient in lime. Adoption of the age long practice of applying ash and Sudumannu in South Kanara for rice as well as for other dry crops and the application of wood ash in Malabar for upland rice, for dry nurseries and for broadcast rice in wet lands may not be merely with the object of conservation of soil but with the object of helping the crop to utilize soil moisture more advantageously. Moderate application of lime practiced over a period of years is likely to have better advantages than heavier doses applied at longer intervals since the solubility of most of the minor elements is reduced by such heavy applications.

The application of a single element to the soil is usually found to be beneficial only within fairly narrow limits. This is but to be expected, for such single addition if applied in quantity must upset the balance of fertiliser materials in the soil. Since the amount of one element which the plant can absorb depends on this balance it appears that the future investigations on the manurial aspect of rice has to be so orientated as to include not only the major plant food elements N, P and K but also other soil amendments such as lime and minor elements so as to determine the optimum quantities of each ingredient to fix up a balanced manure.

Summary : Under the soil conditions existing in South Kanara, rice is found to respond to application of potash and lime at low

levels in combination with nitrogen and phosphoric acid. From the various attributes studied it is seen that there is increase in the different quantitative characters contributing for yield due to application of potash and lime. Due to the fair margin of profit the proposition is economically sound.

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„ 433,	Para 1,	„ („ „ 2)	„ („ „ 1)