

Studies on Levels and Times of Application of Phosphorus and Potassium on Rice

By

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ABSTRACT

The field investigation was conducted during *Rabi* 1970 to study the response of IR 5 rice for phosphorus and potassium at two levels (40 and 80 kg/ha each) and three times of application (fully basal, half basal plus half top dressing and fully top dressing). The rice crop did not respond for phosphorus and potassium beyond 40 kg each. Total basal application of P and K was the best method of fertilization for the crop than either split application or top dressing alone.

INTRODUCTION

One of the major keys to higher crop production in case of high yielding varieties of rice is adequate and timely fertilization. Information on the response behaviour of the recently released high yielding varieties for the two major nutrient elements viz., phosphorus and potassium is inadequate.

Aaron *et al.* (1971) based on experiments conducted on cultivated field at Coimbatore (Tamil Nadu) recommended an application of 60 kg of phosphoric acid per ha for IR 8. rice Bhumik (1966) reported that in Thanjavur district of Tamil Nadu the response to potash was upto the level of 30 kg/ha.

Mahapatra (1969) observed that the timing of phosphorus depends on

two factors viz., requirement of the plant and the availability of soil phosphorus. He concluded that because of the poor utilisation of soil phosphorus by rice plant in its early stages a basal application is desirable. Bhumbia and Rana (1965) from Punjab found that application of phosphorus at maximum tillering stage increased the yield. Chandrasekaran (1967) found that basal application of potassium at planting was better than split application. However, Hallappa *et al.* (1970) reported that split application of phosphorus gave better grain yield.

The foregoing lines amply bring to focus the lacunae in the fertilization of high yielding rice varieties and urgent need to resolve them. With the object of eliciting information on some of these aspects the present investigation

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was undertaken to study the effect of two levels, one of which was higher than the existing recommendation each of phosphorus and potassium and to compare the efficiencies of three times of application (basal, half basal plus half top dressing and top dressing).

MATERIALS AND METHODS

The field experiment was laid out during *kharif*, 1970—71 at the Agricultural College Farm, Madurai under split plot design with four replications. The field soil was clay loam with pH 7, 2 and E. C. 0.58. The fertility of the soil on analysis was classified as low in nitrogen, medium in phosphorus and high in potash. The levels of phosphorus and potassium (40 kg and 80 kg/ha each) were allotted to the four main plots and the times of application (i) full quantity as basal, (ii) full quantity as top dressing (iii) half the quantity as basal and half the quantity as top dressing were assigned to 9 sub plots.

Nursery was sown on 12-8-70 with IR 5 rice of 140 days duration. The main field was thrown into net plots of the size 3.10 x 2.10 m. The phosphorus and potassium fertilizers were applied as per treatment schedule and the seedlings were transplanted on 14-9-1970. The spacing adopted was 20 x 10 cm and two seedlings were planted per hole. The crop was harvested on 6-1-1971. Nitrogen was applied in the form of urea at 120 kg/ha uniformly to all the plots, half the dose applied basally before planting and the other half as top dressing at the panicle initiation stage. Super-phos-

phate (16 per cent P_2O_5) and muriate of potash (55 per cent K_2O) were applied to the plots requiring basal application before transplanting as per the treatment schedule. Phosphorus and potassium were top dressed in bands at the floral initiation stage (70 days after planting) along the rows of plants.

RESULTS AND DISCUSSION

a) **Levels of phosphorus and potassium :** From Table 1, it may be seen that the height of plant, productive tillers, length of panicle, number of filled and chaffy grains, thousand-grain weight were not significantly influenced by the application of phosphorus and potash upto 80 kg per hectare. Consequently, the levels of phosphorus and potassium did not significantly influence the grain yield. This may be due to medium to high initial fertility of soil phosphorus and potash at the site of the experiment. The results are in line with the findings of Mariakulandai *et al.* (1965) who obtained non-significant response for the application of phosphorus. Dubey and Das (1961) also observed that higher level of potassium failed to influence the grain yield. There was no significant increase in straw yield due to phosphorus and potash application. It seems, therefore, that for IR 5 rice 40 kg each of phosphorus and potash is sufficient for getting maximum yield.

b) **Time of application :** Significant difference in grain yields arose between the times of application. Single application of phosphorus and potassium as a basal dose was superior

TABLE 1. Response of IR 5 rice to phosphorus and potash application

Treatments	1	2	3	4	5	6	7	8	9
Main plots (P and K)									
P ₄₀ K ₄₀	77.81	11.20	8.67	20.8	81.1	21.1	28.3	3858	4661
P ₄₀ K ₈₀	80.02	11.38	8.83	20.8	85.1	22.3	28.3	3934	4699
P ₈₀ K ₄₀	82.00	11.42	9.04	21.0	86.0	22.8	27.9	3746	4498
P ₈₀ K ₈₀	82.13	11.44	8.07	20.6	85.7	22.2	28.2	3882	4699
S.E.	1.94	1.67	1.23	0.2	8.8	1.6	0.2	313	388
C. D. (5%)	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Sub plots (Time of application)									
Pb Kb	80.85	11.73	9.3F	21.2	88.5	21.3	28.0	4197	5801
Pb Kt	81.13	11.80	9.20	20.8	86.0	20.8	28.5	4147	4461
Pb Kbt	80.70	11.73	8.90	20.6	85.2	20.4	28.0	3972	4724
Pt Kb	80.20	11.65	9.00	20.6	82.7	22.8	27.3	3721	4899
Pt Kt	80.48	10.77	8.05	21.1	81.7	24.2	28.0	3583	4298
Pt Kbt	81.98	10.66	8.05	20.8	75.4	22.4	28.2	3621	4573
Pbt Kb	81.10	11.46	8.90	20.8	85.2	23.5	28.5	3934	4736
Pbt Kt	78.46	10.97	8.05	20.5	83.4	21.9	27.3	3771	4348
Pbt Kbt	79.47	11.50	0.05	21.0	83.2	22.1	28.1	3847	4598
S.E.d	1.27	0.99	0.15	0.27	6.3	2.1	0.2	125	551
C. D. (5%)	N.S.	0.30	N.S.	N.S.	N.S.	N.S.	N.S.	250	1002

1. Plant height 105th day after planting [cm] 2. Number of tillers on 105th day after planting
 3. Number of productive tillers per hill 4. Length of panicle (cm) 5. Number of grains per panicle
 6. Number of chaffy grains per panicle 7. 1000-grain weight [g] 8. Grain yield [kg/ha]
 9. Straw yield [kg/ha].

to all the other methods of application. The advantage of early application of phosphorus on grain yield was stressed by Mahapatra (1969). George and Sreedharan (1970) also reported in favour of applying the entire quantity of potassium as basal application.

Significant increase in straw yield for the basal application of phosphorus and potassium was observed and this is in conformity with the findings of Subramanian (1970).

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