

# Response of Rice to Foliar and Soil Application of Nitrogen and Phosphorus

By

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## ABSTRACT

The response to foliar versus soil application of nitrogenous and phosphatic fertilizers was studied in Co. 29 paddy. Three levels of nitrogen and three levels of phosphorus namely 0, 17, 34 kg/ha were tried under (i) soil (ii) foliar, (iii) partly as soil and partly as foliar applications individually and in combination with each other. Foliar spray application was not superior to the soil application. A dose of 34 kg nitrogen and 17 kg of  $P_2O_5$ /ha gave the maximum response when applied through foliage or through soil.

## INTRODUCTION

It has been well established that all plant nutrients are absorbed through the leaves of plants and this absorption is remarkably rapid and complete. Foliar application has been found to be effective with all macro and micro-nutrients except in the use of iron. Subramaniam (1959) reported that foliar application of 34 kg nitrogen/ha in two split doses of 17 kg each had given maximum yield with an increase of 9.4 per cent over control during 1956–57 at Paddy Breeding Station, Coimbatore.

Narayanan and Vasudevan (1957) found that foliar spray of urea at 1 per cent level increased grain yield of paddy by 6 per cent and super phos-

phate at 1 per cent foliar spray (11 kg/ha) increased the yield by 14.4 per cent over the control at Coimbatore. Mariakulandi (1957) while reviewing the experiments conducted in Tamil Nadu, concluded that potash application did not in general increase the yield of paddy. Therefore, this study was undertaken to find out the response of foliar and soil applications of nitrogen and phosphorus at various levels with the ultimate object of increasing rice yield.

## MATERIALS AND METHODS

The experiment was conducted in wetlands of Agricultural College, Coimbatore in Navarai Season (February to June) 1964 with the short duration blast resistant variety of Co. 29 paddy. The three

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TABLE 1 (a). Tillers/Hill

Treatment	Mean No. of tillers
Soil	10.23
Foliar	9.20
$\frac{1}{2}$ S + $\frac{1}{2}$ F	9.54
C. D.	0.79

Table 1 (b). Manure Levels

N <sub>0</sub>	P <sub>0</sub>	9.48
N <sub>0</sub>	P <sub>15</sub>	9.59
N <sub>0</sub>	P <sub>30</sub>	9.55
N <sub>15</sub>	P <sub>0</sub>	9.66
N <sub>15</sub>	P <sub>15</sub>	9.50
N <sub>15</sub>	P <sub>30</sub>	9.82
N <sub>30</sub>	P <sub>0</sub>	9.63
N <sub>30</sub>	P <sub>15</sub>	10.10
N <sub>30</sub>	P <sub>30</sub>	9.59

levels of 0, 17, 34 kg/ha for nitrogen and phosphorus were allotted to main treatments and the three modes of application of fertilizers viz., soil, foliar and half soil plus half foliar to sub-treatments. The experimental design was split plot and the treatments were randomised and replicated three times. The gross and net plot sizes were 6 m × 2 m and 5.6 m × 1.4 m. The spacing adopted was 15 cm × 10 cm. Commercial urea and superphosphate were used as a source of nitrogen and phosphorus. The

foliar spraying unit adopted was 250 gallons/ha. Foliar spraying was done in two split doses, the first 30 days after planting and the next 15 days after planting, at 3.3 per cent and 1.6 per cent urea. The plots other than the foliar spray treatments were given water spray. Spraying was done in the morning hours between 6.30 A. M.

TABLE 2 (a) Plant height.

Treatments	Mean of plant height (cm)
Soil	125.34
Foliar	124.79
$\frac{1}{2}$ S + $\frac{1}{2}$ F	124.00
C. D.	3.23

TABLE 2 (b) Plant height in nitrogen manure levels

Treatments	Mean height of plant (cm)
N <sub>0</sub>	120.98
N <sub>15</sub>	125.87
N <sub>30</sub>	127.13
C. D.	3.63

Table 2 (c) Plant height in phosphorus manure levels

P <sub>0</sub>	122.38
P <sub>15</sub>	125.41
P <sub>30</sub>	126.20
C. D.	3.63

TABLE 3. Panicle Length

Treatment	Mean length of panicle (cm)
Soil	20.44
Foliar	20.52
$\frac{1}{2}$ S + $\frac{1}{2}$ F	20.08
C. D.	0.35

TABLE 4. Filled grains/panicle

P/N	N <sub>0</sub>	N <sub>15</sub>	N <sub>30</sub>
P <sub>0</sub>	44.51	39.03	48.36
P <sub>15</sub>	47.00	47.26	49.64
P <sub>30</sub>	55.11	50.44	46.32
C. D.	4.85		

to 11 A. M. when the dialation of the stomatal opening would be maximum. No scorching effect was noticed in the crop.

## RESULTS AND DISCUSSION

**Tillers/hill (45th day)** Though soil application had significantly increased the number of tillers over the foliar, yet it remained on par with split application. Regarding the various levels of nitrogen and phosphorus, the trend was in favour of N<sub>34</sub> P<sub>17</sub> which recorded maximum number of tillers.

### Plant Height

There was an increase in the plants for all the three treatments but the increase in height among them was not manifested. In the manure levels, both levels of 34 kg and 17 kg nitrogen/ha

recorded significant increase in height over the control but on par with each other. The trend was in favour of 34 kg nitrogen level. Phosphatic fertilizers had also exercised its influence in increasing the height of plants. Phosphorus at 34 kg level had recorded maximum height and proved to be superior over control but on par with 17kg P<sub>2</sub>O<sub>5</sub> level.

### Panicle Length

The foliar and soil application of fertilizers had significantly increased the length of panicle over the split treatment. Levels of fertilizers did not bring out any significant variation in the length of panicle. Iyengar (1963) found no response for the panicle length, regarding phosphorus application at 34 kg and 68 kg level/ha. However, the trend was in favour of N<sub>34</sub> P<sub>17</sub>.

TABLE 5. Weight of thousand grains

Treatment	Mean weight of thousand grains (g)
Soil	21.516
Foliar	21.959
$\frac{1}{2}$ S + $\frac{1}{2}$ F	22.839
C. D.	1.063

### Productive Tillers

Neither the foliar nor the soil application expressed the superiority over each other in increasing the productive tillers. Nitrogen at 17 kg level/ha though recorded maximum number of

TABLE 6 (a) Grain Yield/ha

Treatment	Mean grain yield (kg/ha)
Soil	3689.09
Foliar	3539.10
$\frac{1}{2}$ S + $\frac{1}{2}$ F	3689.09
C. D.	N. S.

Not-Significant

Table 6 (b). Effect of nitrogen levels on grain yield

Treatment	Mean grain yield in kg/ha
N <sub>0</sub>	3515.50
N <sub>15</sub>	3721.90
N <sub>30</sub>	3784.70
C. D.	174.88

productive tillers, the increase was not, however, statistically significant.

### Filled Grains / Panicle

There was no response in the number of grain per panicle in the various methods of application. Phosphorus ( $P_2O_5$ ) at 34 kg / ha alone had increased the filled grains in the panicle over the control significantly. This is in conformity with the work of Iyengar (1963) and Venkatesan (1964). The main functions of phosphorus is considered to be filling up

grains in the panicle and thus it might have influenced the number of filled grains.

### Weight of Thousand Grains

The split application of half soil plus half foliar was significant over soil application but on par with foliar application. In manurial level, the trend for the maximum weight of thousand grains sample was exhibited in favour of nitrogen at 17 kg and phosphorus at 34 kg / ha.

### Grain yield

Grain yield differences were not significant under different methods of application and thereby showed that the foliar application was equal to the soil application. In the manurial levels nitrogen at both the levels registered increased grain yields significantly over the control. The interaction suggested the effects of combining 34 kg phosphorus / ha. Hence economic return can be profitably obtained at a lower level combination of N<sub>34</sub> P<sub>17</sub>.

### Straw yield

The different methods of application of fertilizers did not exercise

Table 6 (c) Grain yield interaction

P/N	N <sub>0</sub>	N <sub>15</sub>	N <sub>30</sub>
P <sub>0</sub>	3183.80	3775.70	3775.70
P <sub>16</sub>	3659.10	3739.90	3892.30
P <sub>30</sub>	3659.10	3659.10	3686.09
C. D.	174.88		

TABLE 4. Straw yield/ha in nitrogen levels

Treatment	Mean straw yield in kg/ha
N <sub>0</sub>	8690
N <sub>16</sub>	9300
N <sub>30</sub>	9829
C. D.	672.64

any influence on the yield of straw significantly. In manurial level, application of nitrogen at both the levels increased the yield of straw over the control but on par with each other. This finding is in conformity with that of Abdul Samad (1952) Phosphorus (P<sub>2</sub>O<sub>5</sub>) at 34 kg/ha level recorded maximum increased yield of straw over control but on par with 17 kg/ha level.

Thus, the overall finding indicated that foliar application was equivalent to the soil application. Regarding manurial levels, the trend of application was in favour of N<sub>34</sub> P<sub>17</sub>.

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