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# RESPONSE OF CO-25 AND ADT-27 RICE TO NITROGEN, PHOSPHORUS, POTASH AND GREEN MANURE

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It is customary to evaluate the response to nutrients when a new strain is released for cultivation. Response in rice up to 200 Kg N/acre had been reported from Japan and U. S. A. (Doyle, 1966). A linear response upto 80 Kg N/hectare was recorded (Chandrarathna, 1961). An economically optimum dose of 90 Kg N/hectare for ADT-27 has been indicated (Kulandaivelu, 1967). Most Indian soils, apart from the laterites, are relatively well supplied with K and for most crops, there is little need for K fertilizers (Stewart, 1947). However, numerous pockets of rice soils with low available P and K status have been reported suggesting scope for a good response for P and K in these soils (Mariakulandai and Srinivasan, 1959). In this context two varieties CO-25 and ADT-27 of known potentialities to high doses of fertilizer, bave heen tested for their response to N, P and K fertilizers and green manure.

## Materials and Methods

A strip plot design consisting of 2 levels of green manure (0 and 5000 Kg/ha), 5 levels of N (0, 20, 40, 60 and 80 Kg/ha), 3 levels of P (0, 20 and 40 Kg $P_2O_5$/ha) and 4 levels of K (0, 20, 40 and 60 Kg $K_2O$/ha), replicated twice was adopted. Green manure (*Sesbania speciosa*) and P (as Super phosphate) were applied as basal dressing. N (as ammonium sulphate) and K (as muriate of potash) were applied in two split doses, first at planting and the rest at tillering. CO-25 was tested during 1965 and 1966. ADT-27 was tried in 1967. The soil characteristics of the experimental field (E Block of Central Farm Wetland) are given tn Table 1.

## Results and Discussion

(a) *Grain Yield*: With CO-25 during 1965 and 1966 none of the treatments significantly influenced grain yield. However, during 1966 testing for individual degrees of freedom for N, a quadratic trend was seen. This trend may mean that the optimum N dose for grain yield may lie lower than $N_4$ i. e., 80 Kg N/ha (Table 2). During 1967, with ADT-27, significant response in yield due to green manure, N and P was recorded (Table 3). The response to green manure is in conformity with earlier results obtained. This trend is in line with earlier work (Anon 1956).

**Table 1**

**Analysis of experimental soil**

| Mechanical composition (%) | | Total nutrients (%) | | Available nutrients (kg/ha) | | PH (1:2 Soil water ratio) | E.C (m.mhos/ cm) | C E.C. (me/100g) |
|---|---|---|---|---|---|---|---|---|
| Clay | 58.3 | N | 0.07 | N | 185 | 7.3 | 0.3 | 26.5 |
| Silt | 20.3 | $P_2O_5$ | 0.05 | P | 15 | | | |
| Coarse sand | 10.0 | $K_2O$ | 1,01 | K | 300 | | | |
| Fine sand | 11.2 | Organic matter | 0.89 | | | | | |
| | | $Fe_2O_3$ | 9.12 | | | | | |
| | | $Al_2O_3$ | 4.79 | | | | | |

Table 2.

Effect of nutrients on grain and straw yield of CO-25 in 1966

| Treatments | Grain yield (Kg/plot) | Straw yield (Kg/plot) |
|---|---|---|
| N Kg/ha | | |
| 0 | 4.89 | 8.20 |
| 20 | 5.40 | 9.64 |
| 40 | 5.28 | 9.84 |
| 60 | 5.29 | 11.15 |
| 80 | 4.76 | 11.75 |
| Mean | 5.12 | 10.12 |
| Response equation $Y = 0.026 X + 0.0004X^2$ | 4.92 | $SE_D$ : 1.31<br>CD : 2.94 |
| K Kg/ha | | |
| 0 | 9.80 | |
| 20 | 10.21 | |
| 40 | 10.27 | |
| 60 | 10.17 | |
| Mean | 10.11 | |
| | $SE_D$ : 0.52 | |
| | CD . 1.09 | |
| Green manure Kg/ha | | |
| 0 | | 9.01 |
| 5000 | | 11.32 |
| Mean | | 10.16 |
| | | $SE_D$ : 0.80 |
| | | CD: 1.83 |

**Table 3**

**Effect of nutrients on grain and straw yield of ADT-27 in 1967**

| Treatments | Grain yield (Kg/plot) | Strawyield (Kg/plot) |
|---|---|---|
| N Kg/ha | | |
| 0 | 4.45 | 6.15 |
| 20 | 5.32 | 7.46 |
| 40 | 5.78 | 829 |
| 60 | 6.28 | 9.37 |
| 80 | 7.12 | 10.18 |
| Mean | 5.79 | 8.29 |
| | $SE_D$ : 0.17 | 0.26 |
| | CD ; 0.40 | 0.59 |
| P Kg/ha | | |
| 0 | 5.68 | 8.14 |
| 20 | 5.69 | 8.38 |
| 40 | 5.97 | 8.71 |
| Mean | 5.78 | 8.41 |
| | $SE_D$ : 0.09 | 0.08 |
| | CD : 0.20 | 0.17 |
| Green manure Kg/ha | | |
| 0 | 5.47 | 7.92 |
| 5000 | 6.09 | 8.89 |
| Mean | 5.78 | 8.4S |
| | $SE_D$ : 0.11 | 0.16 |
| | CD : 0.26 | 0.36 |

**Table 4**

**NP interaction on grain yield of ADT-27 (Kg/Plot)**

| Level | $P_0$ | $P_1$ | $P_2$ | |
|---|---|---|---|---|
| $N_0$ | 4.36 | 4.32 | 4.67 | |
| $N_1$ | 5.14 | 5,35 | 5.48 | $SE_D$ : 0,17 |
| $N_2$ | 5.99 | 5.70 | 5.61 | CD : 0.40 |
| $N_3$ | 6.05 | 6,13 | 6.53 | |
| $N_4$ | 6.84 | 6.96 | 7.55 | |
| | $SF_D$ = 0.09 | | | |
| | CD = 0.20 | | | |

For N levels at any P level : $SE_D$ = 0.20, CD = 0.45
For P levels at any N level : $SE_D$ = 0,14, CD = 0.29

The response to N on further investigation, was found to be essentially inear, This is in close agreement with recent work (Kulandaivelu, 1967), wherein the linearity was observed up to 90Kg/ha. The response to P was similarly studied and was found to be linear indicating scope for increasing the P dose beyond 40 Kg $P_2O_5$/ha. Necessity for further investigation to fix the economically optimum dose in P for ADT-27 is thus indicated.

(b) *Straw* Yield: With CO-25 strain, in 1965, none of the treatments except GNPK, was significant. However, in 1966, green manure at 5000 Kg/ha significantly increased straw yield over control (Table 2). Besides this NK interaction was also significant (Table 5).

Table 5

NK interaction on straw yield of CO-25 (Kg/plot)

| | $K_0$ | $K_1$ | $K_2$ | $K_3$ |
|---|---|---|---|---|
| $N_0$ | 8.08 | 8.05 | 7.81 | 8.84 |
| $N_1$ | 9.60 | 9.91 | 9.68 | 9.35 |
| $N_2$ | 9.61 | 9 78 | 10.33 | 9.65 |
| $N_3$ | 10.89 | 11.12 | 11.74 | 10.83 |
| $N_4$ | 10.83 | 12 21 | 11.78 | 12 18 |

For N levels at any K level : SED = 1.31, CD = 2.94
For K levels at any N level : SED = 05.1, CD = 1.09

The comparison of N levels at each of the levels of K showed the predominant positive influence of N on straw yield irrespective of the presence or absence of K. The comparison of K levels at each of the levels of N indicated a supplementary effect of K in influencing the straw yield. These trends are in line with those indicated in an earlier review (Glander and Peter, 1962). Further, the three factor interactions GNP and NPK were also statistically significant (P = 0.01). But these are tco complex for any practical interpretation. With regard to ADT-27, the influence of treatments on straw yield, were quite similar to response in grain yield. The trend of response in straw yield to added N and P was essentially linear. The response of N is in complete agreement with the recent work (Kulandaivelu, 1967). Remarks similar to those for response in grain yield to P, hold good here also.

**Summary**

A strip plot design consisting of two levels of green manure, 5 levels of N, 3 levels of $P_2O_5$, and 4 levels of $K_2O$ replicated twice was adopted with CO-25 as a test crop in 1965 and 1966 and ADT-27 in 1967. The conclusions are as follows. Green manure at 5000 Kg/ha positively influenced grain and straw yield of ADT-27. With CO-25, the influence of green manure was observed in straw yield in one year. Response to N in grain yield of CO-25 was quadratic, whereas for ADT-27, it was linear. Response to P was recorded in yield of grain and straw in ADT-27 only. Phophorous at 40 Kg/ha appears to supplement the influence of N on grain yield of ADT-27. A marked positive influence of N on straw yield of CO-25 irrespective of the presence or absence of K was recorded. A supplementary effect of K in influencing straw yield of CO-25 in combination with N, was also observed.

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REFERENCES

Anon. 1956. *Rice and its manuring.* International Potash Institute, Berne. pp. 59.

Chandrarathna, M. F. 1961. Variety nitrogen interaction in rice. *Int. Rice. Commn. Newsl.*, 10: 17.

Doyle, J. J. 1966. The response of rice to fertilizer. *F. A. 0. agric. Stud.*, 70:7

Glander, H., and Peter, A. V. 19€2. *Discoveries and Experience of Manuring Rice.* International Potash Institute, Berne- pp, 36.

Kulandaivelu, R. 1967. Studies on the response of ADT-27 Rice *(Oryza sativa* L) to graded doses of nitrogen and spacing. M, Sc. *(Ag)* dissertation approved by Madras University.

Mariakulandai, A,, and Srinivasan, T. R. 1959. Bigger Paddy Yield in Madras Through Soil Tests. *Fertilizer News, 4* : 6-8.

Stewart, A B. 1947. *Report of Soil Fertility Investigation in India with Special Reference to Manuring* Army Press, New Delhi. pp, 107.

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