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Trends in N uptake in paddy grain

by

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Introduction: It is well known that rice yield in India and South East Asia, countries is very low (Basak, 1956). While low doses of N give considerable yield responses (Basak, 1956, Basak *et al.* 1957 and 1960 and Basak and Klemme, 1959) higher doses of N over 40 lb per acre are seldom effective (Ghose *et al.* 1956, Mariakulandai, 1957). Crop yields are generally conditioned by soil N content (Jenny, 1941). While tropical soils are low in organic matter and N reserves, failure to secure commensurate yield responses to heavy N application, seems to be a paradox (Basak, 1962). So rice production cannot be boosted merely with larger fertilizer production in these countries in the absence of a solution to this problem (Basak, 1962).

In a review of the efficiency of fertilizer usage and soil characteristics in South East Asian countries, it was indicated that the variety of rice grown in these countries was a poor consumer of N both in absolute amounts and in its efficiency of utilization in grain production (Dierendonck and Van, 1960). The implication was the response to N is a characteristic governed by genetic constitution of the variety grown and was therefore hardly amenable to improvement by fertilization (Basak, 1962). However, the *japonica* rices and various *japonica* × *indica* selection tried in India showed no superiority over local *indica* selection (Ghose *et al.* 1956). It is frequently mentioned that *indica* varieties are more active in N uptake during early stages of growth than *japonica* varieties and that this is inversely related to N responsiveness. In a comparison of Peta and IR 8 it was concluded that active N uptake *per se* at earlier stages of growth, is not necessarily associated with low N responsiveness of a variety (Anon, 1966). Again in a comparison of tall and dwarf *indicas* and ADT 27 for N response, most varieties were found to yield their best at 60 kg N/ha. Reduction in grain yield at high levels of added N was drastic for weak-strawed varieties or selections such as ADT 27. It was concluded that tall weak-strawed tropical varieties are lower yielding in any season than dwarf indicas (Anon, 1966).

CO 25 is a selection from CO 4 and ADT 10 crosses. ADT 27 is a selection from Norin 8 and GEB 24 crosses. The trends in N uptake in grain of these two selections are reported and compared here.

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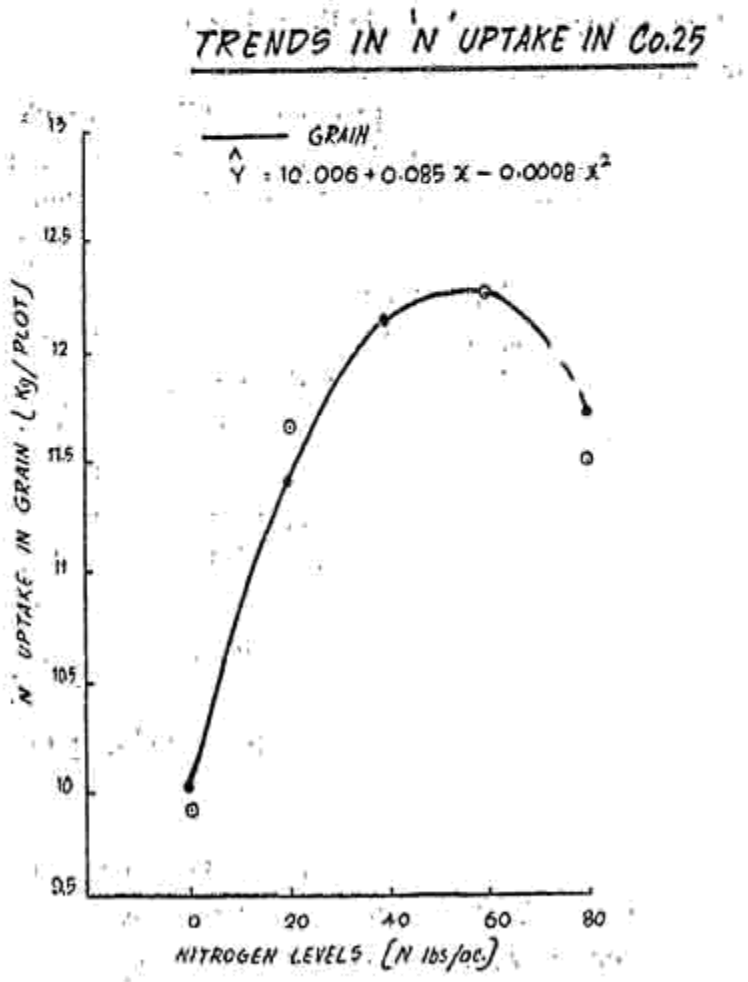
Materials and Methods: A complex fertilizer trial consisting of two levels of green manure (0 and 5000 lb/acre) five levels of N (0, 20, 40, 60 and 80 lb N/acre), three levels of P (0, 20 and 40 lb of P_2O_5/acre) and four levels of K (0, 20, 40 and 60 lb of K_2O)/acre) replicated twice was laid in the strip plot design for three seasons (1965, 1966 and 1967) in wetlands of Central Farm, Coimbatore. CO 25 was tested in the first two seasons and ADT 27 in the third year.

Results and Discussion: CO 25: In 1965, N uptake in grain was influenced by N fertilizer alone and the combination GN; In the second year similar results repeated (Table 1).

The overall trend was examined employing orthogonal polynomials. The whole trend is considered to be quadratic eventhough the initial trend would appear linear (Fig. 1). It would appear that CO 25 could not utilize

FIG. 1.



efficiently added N beyond 50 lb N/acre. This indication is in line with earlier work with similar strain (Ghose *et al.* 1956; Mariakulandai, 1957; Dierendonck and Van, 1960; Basak, 1962 and Anon, 1966).

TABLE 1. *Mean values of N uptake in grain in kg - CO 25*

	N_0	N_1	N_2	N_3	N_4	S.E.	C.D.
1965							
GO	8.48	11.75	12.06	12.60	13.86	0.383	1.079
GI	13.14	12.42	12.62	12.60	10.16		
Mean	10.81	12.08	12.34	12.60	12.01	0.271	0.763
1966							
GO	7.70	11.24	11.34	12.29	11.82	0.442	1.245
GI	10.36	11.16	11.03	11.46	10.03		
Mean	9.03	11.20	11.18	11.87	10.92	0.313	0.880
1965 and 1966							
GO	8.09	11.49	11.70	12.45	12.84	0.412	1.312
GI	11.75	11.79	11.83	12.03	10.09		
Mean	9.92	11.64	11.76	12.24	11.47	0.292	0.929

ADT 27: The trend of N uptake in grain for the *japonica*×*indica* selection was different. N uptake was influenced by N fertilizer and combinations GN, GP and NP significantly (Tables 2 and 3).

TABLE 2. *Mean values of N uptake in grain in kg ADT 27*

	N_0	N_1	N_2	N_3	N_4	S.E.	C.D.
1967							
GO	10.09	14.30	15.00	15.95	17.59	0.347	0.977
GI	11.32	14.43	13.45	15.17	17.24		
Mean	10.71	14.37	14.23	15.56	17.42	0.245	0.690
P_0	10.70	14.90	14.98	16.22	16.32	0.425	1.196
P_1	9.83	14.80	13.92	14.59	17.22		
P_2	11.58	13.40	13.78	15.87	18.71		

TABLE 3. *Mean values of N uptake in grain in kg ADT. 27*

	P_0	P_1	P_2	S.E.	C.D.
GO	14.39	14.20	15.16	0.269	0.757
GI	14.86	13.94	14.18		

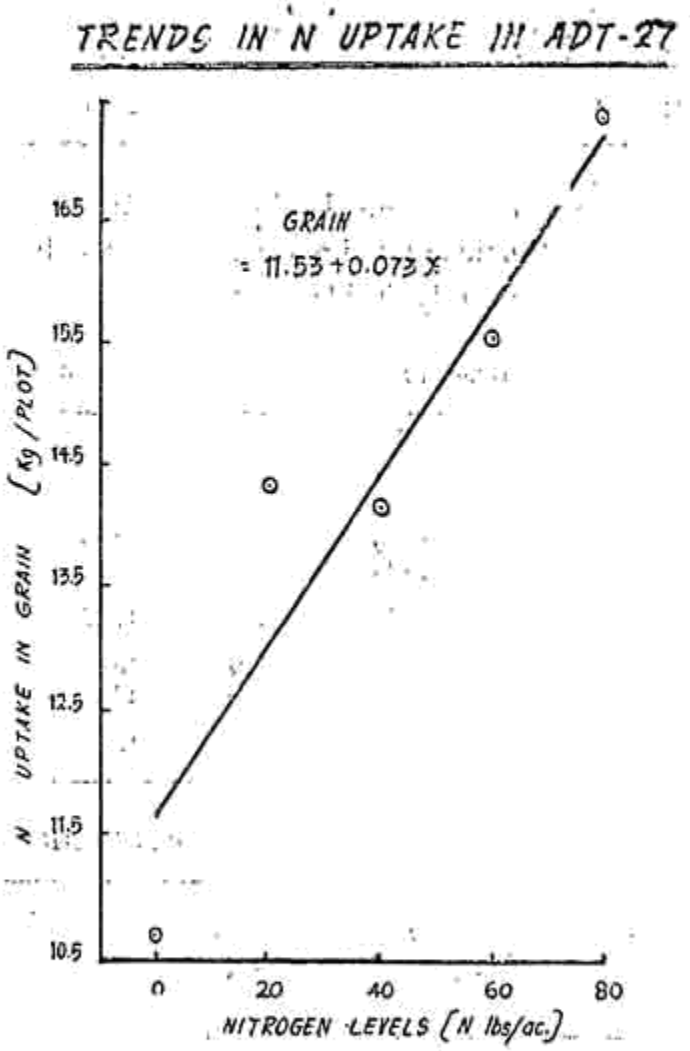
GO = No green manure
GI = 5000 lb/acre green manure
P_0 = No P_2O_5
P_1 = 20 lb P_2O_5/acre
P_2 = 40 lb P_2O_5/acre

No = No N
N_1 = 20 lb N/acre
N_2 = 40 ,,
N_3 = 60 ,,
N_4 = 80 ,,

Note: The mean values in kg have been coded for convenience of expression. To convert into kg/acre divide by 0.84.

The effect of added N in N uptake is linear (Fig. 2). It would indicate that ADT 27 is able to utilize added N efficiently at higher doses. Green manure and P influenced N uptake, in combination with N or in combination amongst themselves. Their independent effects were not significant. The effect of green manure with no N is marked, with increasing levels of added N_1 this effect fades away. But the effect of added N is quite predominant both in the presence and absence of green manure. The effect of added P is marked at the highest level of added N and vice versa. In the presence of P, the effect of green manure is little pronounced.

FIG. ..



Comparing the N uptake trends in CO 25 and ADT 27 grain under similar conditions, it may be inferred that the *japonica* × *indica* selection had shown better potentialities in terms of utilization of added N as reflected by the linear trend while CO 26 had exhibited an overall quadratic trend. Besides in ADT 27 the complementary effect of P in N uptake, is also seen whereas such a trend is absent in CO 25. These trends are in line with similar tests (Anon, 1966 and Basak, 1962).

Summary and Conclusions: The N uptake trends in two varieties CO 25 and ADT 27 are presented and compared. The response in N uptake in CO 25 grain due to added N is quadratic. In ADT 27 the trend is linear. Besides, in ADT 27, the complementary effect of added P in the presence of added N is also indicated.

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AWARD OF Dr. A. L. MUDALIAR PRIZE

Thiru P. VEERASEKHARAN, Assistant Lecturer in Botany, Agricultural College and Research Institute, Coimbatore, has been awarded the Dr. A. L. Mudaliar Prize of the University of Madras for securing the First rank in the M.Sc. (Agriculture) examination of May 1969. Our hearty congratulations to him.
