Vaidya, C S. 1953. Effect of sowing date and manuring on the yield and its components in desi and American cotton. *Ind. Cott. Gr. Rev.*, 7 (4) : 269-78.

Verma, S. S. and M. K. Ghongde. 1959. Ammonium chloride as a fertilizer for cotton. *Ind. Cott. Gr. Rev* , 12 (6) : 469-76.

Verma, S. S., P. S. Lamba and H. P. Dwivedi. 1965. Response of doses of nitrogen, phosphorus and potash on development and yield of indigenous and American cotton. *Ind Jour. Agron* , 10 (2) : 170-7.

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Effect of Levels of N and P_2O_5 and Split Application of Nitrogen on Growth and Yield of High Yielding Wheat Variety (S. 227)

by

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Introduction: The main superiority of dwarf high yielding varieties of wheat lies in higher response per unit nutrient giving nearly two to three times more response as compared with local varieties. Little work has been done on two aspects of manuring of high yielding varieties, i.e., how much and at what stage of plant growth the fertilizers should be applied in different agro-climatic regions.

Materials and Methods: To study the effect of different levels of N and P_2O_5 and split application of N on growth and yield of high yielding wheat variety (S.227), an experiment was laid out in split plot design with levels of fertilizers in main plots and times of N application in sub-plots with three replications at Ranchi Agricultural College Farm, Kanke, during 1967-68. The soil was sandy-clay-loam of medium fertility with a pH of 5.65.

(a) Basal dose - 60 kg K_2O/ha

(b) Main plot treatments –

Treatments	Levels of fertilizers, kg/ha		
	N		P_2O_5
L_1	80	+	48
L_2	180	+	72
L_3	160	+	96

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(c) Sub-plot treatments –

Times of nitrogen application	Fractions of nitrogen applied at				
	Sowing stage	3-leaf stage (16)	Tillering stage (31)	Ear-emergence stage (53)	Maturity stage (101)
T_1	1/2	1/2	—	—	—
T_2	1/2	1/4	1/4	—	—
T_3	1/4	1/2	1/4	—	—
T_4	1/2	—	1/4	1/4	—
T_5	1/3	1/3	1/3	—	—
T_6	1/3	2/3	—	—	—
T_7	2/3	1/3	—	—	—
T_8	2/3	—	1/3	—	—
T_9	1/3	1/3	—	1/3	—
T_{10}	1/4	1/4	1/4	1/4	—
T_{11}	1/5	1/5	1/5	1/5	1/5

Full dose of P_2O_5 was applied at sowing with the first dose of N. To ensure proper germination one pre-sowing irrigation was given. Sowing was done by dibbling method with a row spacing of 22 cm. Initiation of different growth stages were identified by growing check plants in big pots ten days prior to field sowing. Each application of N was followed by irrigation in all the plots. For collecting data five plants were randomly selected in each plot.

Results and Discussion: Data on the effect of different fertiliser levels and times of N application on growth and yield are presented in Tables 1 and 2, respectively.

Total and effective tillers: There was significant increase in total and effective number of tillers per clump due to increased levels of fertilisers. The result was in conformity with that of Raheja and Mishra (1955, 58) and Rai (1961). There was no significant effect of times of N application.

Plant height: Maximum plant height (89.74 cm) was obtained due to L_3 level of fertilisers which was followed by L_2 and L_1 with 85 60 cm and 82.92 cm height, respectively. Woodward (1966) also obtained similar results with wheats of Norin 10 origin at Utah. Split application of N did not influence the height of plants.

Length of ear-head: The average length of ear-heads were maximum (10.99 cm) in case of L_3 followed by L_2 and L_1 with 10.35 and 9.73 cm respectively. Mann (1956, 65) obtained similar results. Again there was no effect of split application of N on this character.

TABLE 1. *Effect of levels of fertilizers on plant characters and yield*

Treatments	Total No. of tillers	No. of effective tillers	Height of plants in cm	Length of earhead in cm	No. of spikelets/ earhead	No. of grains/ spikelet	No. of grains/ earhead	Weight of grains/ earhead in gms	Thousand grain weight in gms	Grain yield in Q/ha	Straw yield in Q/ha	Grain/straw ratio
1	2	3	4	5	6	7	8	9	10	11	12	13
L_1	8.00	7.17	82.92	9.73	19.89	3.07	61.35	2.29	36.27	38.07	62.54	0.61
L_2	9.89	8.80	85.60	10.35	20.46	3.35	68.57	2.59	38.23	45.78	70.36	0.65
L_3	12.24	10.60	89.74	10.98	21.24	3.53	74.93	2.91	39.76	51.84	77.59	0.67
S.E. ± (Mean)	0.199	± 0.174	± 0.431	± 0.081	± 0.653	± 0.230	± 0.991	± 0.024	± 1.750	± 0.759	± 0.829	0.008
C.D. (0.05)	0.781	0.683	1.692	0.320	0.169	0.182	3.888	0.095	0.872	2.757	5.687	0.032

TABLE 2. *Effect of times of nitrogen applicotion on plant characters and yield*

1	2	3	4	5	6	7	8	9	10	11	12	13
T_1	9.84	8.67	86.40	10.86	21.20	3.47	73.64	2.86	38.10	47.41	72.57	0.65
T_2	9.88	8.77	87.42	10.26	20.47	3.19	65.78	2.37	37.77	47.63	75.07	0.63
T_3	10.22	9.06	87.32	10.59	21.09	3.31	69.91	2.54	36.89	49.65	75.08	0.66
T_4	11.22	10.28	87.19	10.43	20.07	3.42	70.84	2.99	40.10	45.60	69.03	0.67
T_5	9.67	7.78	85.93	10.28	20.44	3.34	68.33	2.52	36.91	46.87	68.27	0.69
T_6	9.78	8.67	87.05	10.38	20.15	3.47	69.98	2.45	36.92	44.90	70.81	0.67
T_7	9.05	8.28	86.53	10.46	20.64	3.38	69.89	2.63	38.24	45.84	74.84	0.61
T_8	9.44	8.33	84.93	9.86	20.07	3.06	61.67	2.34	38.18	46.62	68.03	0.68
T_9	10.45	9.44	85.38	10.06	20.27	3.28	66.87	2.76	37.89	40.82	69.82	0.58
T_{10}	11.61	9.59	85.57	10.37	20.05	3.41	70.04	2.61	39.17	43.69	67.03	0.65
T_{11}	9.39	8.61	83.21	10.44	20.38	3.15	64.20	2.50	38.17	38.56	61.23	0.64
S.E. ± (Mean)	0.639	± 0.536	± 1.142	± 0.183	± 0.355	± 0.134	± 2.001	± 0.086	± 1.003	± 0.351	± 0.146	± 0.073
C.D. (0.05)	N.S.	N.S.	N S.	N.S.	0.501	0.265	5.669	0.244	1.482	4.427	7.420	N.S.

Number of spikelets per ear-head: There was significant difference between three levels of fertiliser in producing spikelets per ear-head. L_3 level produced maximum number of spikelets (21.24) and L_2 and L_1 ranked 2nd and 3rd with 20.46 and 19.89 number of spikelets, respectively. So far the effect of split application of N was concerned, T_1 produced the maximum number of spikelets (21.20) per ear-head being at par with T_3 (21.09). Also, T_3 and T_7 did not differ significantly. However, T_{10} being at par with T_2, T_5, T_{11}, T_9, T_6, T_4 and T_8, in descending order, produced minimum number of spikelets (20.05).

Number of grains per spikelet and per ear-head: L_3 produced significantly higher number of grains per spikelet (3.53) and per ear-head (74 93) over that of L_2 and L_1. L_2 and L_1 produced 3.35 and 3.07 number of grains per spikelet and 68.57 and 61 35 number of grains per ear-head, respectively. In case of times of N application there was no significant difference among the treatments T_1, T_3, T_4, T_5, T_6, T_7 and T_{10}. However, T_1 produced the maximum number of grains (3.47, 73.64). Treatment T_8 produced the maximum number of grains per spikelet and per ear-head (3.06 and 61.67) which was at par with T_2, T_9 and T_{11}.

Weight of grains per ear-head: The weight of grains per ear-head was influenced by both sets of treatments. The maximum weight of grains per ear-head (2.91 gm) was obtained by L_3 which was followed by L_2 and L_1 with weight of grains 2 59 and 2 29 gm, respectively. The treatment T_4 was able to produce the maximum weight of grains (2.99 gm) per ear-head which was at par with that of T_1 and T_9, whereas, T_8 produced the minimum (2 34 gm) being at par with T_{11}, T_6, T_5, T_3 and T_2.

Thousand-grain weight: The maximum thousand grain weight of 39.70 gm was produced by the fertilizer level L_3 which was followed by L_2 and L_1 with 38.23 and 36.27 gm respectively. The treatments receiving N at later stages (T_4, T_{10}, T_8 and T_{11}) generally produced more thousand-grain weights than the treatments receiving N at early stages only. The result was in conformity with that of Belger (1965) in Germany.

Grain yield: Statistical analysis of the data for grain yield revealed that the maximum yield (51.84 Q/ha) was obtained by the fertiliser level L_3 (160 Kg N and 96 Kg P_2O_5/ha) which was followed by L_2 (120 Kg N and 72 Kg P_2O_5/ha) and L_1 (80 Kg N and 48 Kg P_2O_5/ha) with grain yields 45.78 and 38.07 Q/ha, respectively. The increase in the grain yield with increasing doses of fertiliser might be due to an increase in the yield attributing components with increased absorption of nutrients. The result was in conformity with that obtained by Bhardwaj and Wright (1967) who recommended the application of N upto 100-200 kg per hectare. As far the time of

N application was concerned, the maximum grain yield was achieved by plants receiving N ¼ at sowing+½ at 3 leaf stage+¼ at tillering stage (T3). However, yields obtained with the treatments T_2, T_1, T_5, T_6, T_7 and T_4 were at par with T_3. The result was in conformity with that obtained by Bonciarelli (1963) who found the highest yield by applying N at 3 leaf stage. From the result it is evident that out of the five split applications of N, the first two, i e., at sowing and 3 leaf stages were more effective in producing more grain yield. Secondly, low yield was obtained by not applying N at 3 leaf stage and also due to late application of N after tillering stage.

Straw yield: Data on straw yield clearly showed that the maximum straw (77.59 q/ha) was produced by L_3 which was followed by L_2 and L_1 in descending order. Likewise grain yield T_3 and T_4 produced the maximum and minimum straw yield.

Grain/straw ratio: In case of grain/straw ratio L_3 and L_2 were at par with each other with the values 0.67 and 0 65, respectively. However, L_1 produced significantly lower grain/straw ratio (0.61). Pugsley (1964) also reported the grain/straw ratio of 0.666 with semi dwarf wheats. The grain/straw ratio was not influenced by different times of N application.

Summary: An investigation to study the response of high yielding wheat, S 227, to different fertilizer levels and split application of N on growth and yield carried out at Ranchi Agricultural College, Kanke reveals that: (i) The fertilizer level L_3 (160 kg N and 96 kg P_2O_5/ha) was superior to L_2 (120 kg N+72 kg P_2O_5/ha) and L_1 (80 kg N+48 kg P_2O_5/ha) in influencing all the yield attributing characters and the yields of grain and straw. However, L_2 was at par with L_3 in case of grain/straw ratio. (ii) Times of N application proved to be effective for all the yield and growth characters except in case of total and effective tillers, plant height, length of ear-head and grain/straw ratio. The maximum grain and straw yields were obtained when N was applied as ¼ at sowing+½ at 3-leaf stage+¼ at tillering stage (T_3). (iii) The interaction effect between levels of fertiliser (L) and times of N application (T) was not significant in any case.

REFERENCES

Belger, V. 1965. Investigations on the effect of late application of N on grain yield and properties and baking quality in varieties of winter and spring wheat. C.F. *Field Crop Abst.*, 19 (1) : 10.

Bhardwaj, R. B. E. and B. Wright. 1967. New Agronomy for dwarf wheat. *Ind. Fmg*, 17 (5) : 24.

Bonciarelli, F. 1963. N manuring of wheat. (Italian) *Progress Agric.* 9 (3) : 323-35.

Mann, H. S. 1956. Studies on the effect of different levels of moisture and nutrients on wheat. *Ind. J. Agron.*, 1 (2) : 81-93.

———. 1965. Response of paddy, wheat, sugarcane, potato, groundnut, and cotton to fertilizers and other agronomic practices on alluvial, black, red and laterite soils of India. *Ind J. Agron.*, 10 (1) : 81-91.

Pugsley, A. T. 1964. Semi-dwarf wheats for Australia. C.F. *Field crop abst.*, 18 (1) : 13.

Raheja, P. C, and K. P. Mishra. 1965. Development studies on crop plants I. Influence of nitrogen, phosphate and potash and calcium alone and in combination on wheat. *Ind. J. Agri. Sci.*, 25 (2) : 87-104.

———. 1958. Development studies on crop plant II. Investigation on character differences induced by fertllization in relation to lodging susceptibility in wheat crops. *Ind J. Agri. Sci.*, 28 (4) : 499-510.

Rai, S. N. 1961. Effect of urea on yield and quality of wheat. M.Sc. (Agronomy) thesis, Bhag. Univ., Bihar.

Woodward, R. W. 1964. Response of some semi-dwarf spring wheats to N and P fertiliser. *Crops & Soils.*, 16 (1) : 28-9.

A Critical Approach to Rice Production in Tamil Nadu*

by

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Introduction: Rice, being a primary food, occupies a pre-eminent position in crop production. In India and particularly in Tamil Nadu, a steady increase both in area and output of rice has been recorded. This increase has been phenomenal in recent times reaching an area of 6.8 million acres and an output of 4.2 million tons with an average acre yield of 1,385 lb. Many factors have contributed towards this end, the chief among them being the use of fertilisers and high fertiliser-responsive strains. A point of saturation is likely to be reached in the area under rice and in the use of inputs. An attempt has been made in this paper to examine critically the various limitations and plan for a better approach towards maximising rice production in the State.

Materials and Methods: The total area, total output and yield per acre of rice and the annual rainfall as published in the Season and Crop Reports of Tamil Nadu Government from the Fasli year 1905-06 to 1965-66 formed the basic material for the study. Quinquennial means were worked out from the year-wise data and presented district-wise. The year 1950-51 was treated as the base year and the subsequent quinquennia were fitted into the plan periods. Madras, a non-agricultural district and Kanyakumari, for want of data, were omitted in the study. The remaining districts of the State (excluding Nilgiris, a hilly district) were found to lend themselves for grouping into four zones based on the area and output of rice, rainfall and soil conditions. Correlations were then worked out for (i) output and area, (ii) yield per acre and area and (iii) yield per acre and rainfall. The soil fertility status of each district was also examined.

Results and Discussion: *Acreage:* The total area under rice in Tamil Nadu is 68 lakh acres as reported for the year, 1967-68. The district-wise

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