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STUDIES ON THE PERFORMANCE OF RICE VAR, IR-8 UNDER VARYING LEVELS OF NITROGEN AND SPACING*

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Responsiveness to nitrogen is one of the major factors contributing to differential capacities of rice varieties to give grain yields and consequently this has been one of the desirable characteristics aimed at, in evolving high yielding varieties. IR-8 the dwarf *Indica* variety developed at I.R.R.I. Philippines in 1962-1963 and introduced into India in 1965-'66 was considered the most outstanding among the introduced exotic selections. The high nitrogen responsiveness of this variety has been experimentally confirmed (Chandler 1956, Anon 1967, Nair, 1968). Ear number per unit area is one of the major factors deciding grain yield. Each variety of rice has an optimum spacing and closer spacing is generally found to be more conducive to obtain better yields for high yielding (Tanaka *et al:* 1974). In the absence of adequate experimental evidence on these two lines for the veriety IR-8. the present investigation was undertaken with a view to arriving at the optimum levels of nitrogen and spacing and their possible interaction effects under the agro-climatic conditions of Kerala.

Materials and Methods

The experiment was laid out at the Model Agronomic Research Station, Karamana attached to the Agricultural College and Research Institute, Vellayani, during the first crop season of 1968-69. The soil on which the experiment was conducted was sandy clay loam having 0.098% total nitrogen 0.053% total PA, 0.058% total K_2O and traces of available P_2O_5 and K_2O The pH was5.4. The experiment was laid out in randomised block design with four replications The treatments were 80, 120, and 160 kg/ha of nitrogen and the spacings were 10×10, 10x15, 10x20, and 10X25 cm.

Thirty days old seedlings were transplanted on the prepared main field after application of fertilizers Superphosphate and muriate of potash were used to supply P_2O_5 and K_2O at the rates of 60 kg/ha each. Ammonium sulphate was used as the source of nitrogen, this being given in three split doses-50% as basal dressing and 25% each four and seven weeks after transplanting.

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Results and Discussion

Data on the mean yield of grain and straw and those on tiller number at harvest and other yield contributory characters are given in Tables 1 and 2. As will be clear from the tables, effects due to nitrogen, spacing and nitrogen x spacing were not significant in the case of yield of grains. An increase of 360 kg. of grain, however, was noticed when the level of nitrogen was raised from 80 kg/ha to 120 kg/ha. The response to the subsequent increase in nitrogen dose from 120 to 160 kg/ha was only 42 kg. Among the treatements of spacing, the highest yield was recorded at a spacing of 10×15 cm. there being a gradual decline as the spacing became wider. The lowest yield was noticed in the case of 10×10 cm spacing. In the case of yield of straw on the contrary, significant response was obtained upto 160 kg/ha. Treatments of spacing failed to bring about significant effect on straw yield.

Of the yield contributory characters, number of panicles per square metre, number of grains per panicle and percentage of filled grains showed significant differences due to spacing, whereas percentage of productive tillers and 1000 grain weight were unaffected. Response due to nitrogen doses remained unaffected in the case of all the yield components.

Lack of significant response of the variety under study to doses of nitrogen above 80 kg/ha is contrary to the results reported earlier (Chandler, 1966; Anon, 1967 and Nair, 1968). Analysis of the soil of the experimental area prior to the experiment showed a nitrogen content of 0.098%. According to the rating chart for soil test data (Muhr *et. al.* 1963) this soil was ranking high for nitrogen. The high nitrogen status of the soil might have contributed to a certain extent to the lack of response to nitrogen in this investigation. The average grain yield obtained at 80 kg/ha in the present study was 4166.79 kg/ha compared to 5968 kg obtained in the earlier experiment by Nair (1968) for the same variety. The general yield level was conspicuously low as compared to the average grain yield of other experiments also. There was, thus a factor other than nitrogen responsible for limiting production. To obtain the average yield recorded in the experiment under study, no additional nitrogen suppply was necessary over 80 kg/ha.

The soil type remaining the same as that of the experiment by Nair (1968) an attempt was made to compare the differences in climatic factors of the two seasons to account for the differences in grain yield. The factor that was found to *bs* responsible to mask full expression of varietal yielding ability was the number of sunshine hours. The average

Table 3. Sunshine hours per day during the period of crop growth

Date	Average sunshine hours/day
J2 . . 7 to 18 . . 7	2.27
19 . . 7 to 25 , . 7	2.24
26 7 to 1 . . 8	4.80
2 . . 8 to 8 . . 8	8.75
9 .. 8 to 15 . . 8	6.24
16 , , 8 to 22 . . 8	6.90
23 . . 8 to 29 . . 8	7.90
30 . , 8 to 5 . . 9	7.92
6 . . 9 to 12 . . 9	2.58
13 . . 9 to 19 . . 9	2.90
20 . . 9 to 26 . . 9	3.34
27 . . 9 to 3 . . 10	3 57
4 . . 10 to 10 . . 10	4.42
11 . . 10 to 17 . . 10	4.35
18 . . 10 to 24 . . 10	6.14
25 . . 10 to 31 . . 10	2.9!
1 . . 11 to 4 . . 11	2.18

number of sunshine hours per day over the period of crop growth was 3 6 as compared to 6.8 reported by Nair (1968).

A study of the fluctuation in the duration of sunlight also revealed that the decline in sunshine hours was conspicuous during the period September to November, when the crop was at the reproductive phase. More than 70% of the total carbohydrate in grain in the case of high yielding varieties is contributed by photosynthesis after flowering (Tanaka, *et al.* 1964). Inadequacy of solar radiation during this period might have thus led to the prevention of full expression of nitrogen response. This was manifested in the earlier phase of crop growth also, as is evident from the differences in the yield contributory characters like panicle number and number of grains per panicle. The same reasons as above will also explain why the effects of spacing were not brought out in grain yield. The advantage due to the initial total number of hills in the case of closest spacing (10 X 10 cm) was carried over till the stage of harvest and also the same was reflected in the number of panicles also. This favourable effect of this individual yield contributory character was however not adequately expressed in grain yield probably due to the inadequacy of solar radiation during the reproductive phase.

Table 1. Effect of levels of nitrogen on yield, yield contributory characters and tiller number at harvest

Levels of nitrogen Kg/ha	Yield of grain Kg/ha	Yield of straw Kg/ha	No. of panicles per m²	No. of grains per panicle	1000 grain weight (g)	Percentage of filled grain	No. of tillers per m² at harvest
80	4166.79	4836.38	281.73	101.26	32.31	75.02	367.00
120	4527.59	5270.89	281.8	97.70	32.06	72.47	344.90
160	4570.04	6147.26	297.87	99.51	31.98	73.54	364.30
F-Test	N.S.	S C.D. 548.9056	N.S.	N.S.	N.S.	N.S.	N.S.

Table 2. Effect of spacing on yield, yield contributing characters and tiller number at harvest

Spacing	Yield of grain Kg/ha.	Yield of straw Kg/ha	No. of panicles per m²	No. of grains per panicle	1000 grain weight (g)	Percentage of filled grains	Number of tillers per m² at harvest
10 x 10 cm	4197.21	5410.28	360.25	89.05	31.87	72.38	431.00
10 x 15 cm	4596.16	6070.86	247.25	99.39	32.10	76.14	298.40
10 x 20 cm	4447.11	5674.62	249.16	94.02	31.91	76.16	336.20
10 x 25 cm	4446.42	5816.96	261.91	114.70	32.09	76.01	342.80
F - Test	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

Summary

Results of the experiment to study the effect of doses of nitrogen and spacing and their possible interaction on rice, variety IR-8 showed that nitrogen supply over 80 kg/ha could not increase the yield significantly. The spacing of 10 X 15 cm though recorded the highest average grain yield, did not show any significant difference as compared to other spacings of 10 X 20 and 10 X 25 cm The yield contributary characters were not influenced by olevels of nitrhgen. Closest spacing recarded significantly higher number of tillers at harvest and lower number of grains per panicle and percentage of filled grains The factor that was responsible for the lack of response beyond 80 kg/ha. for the low grain yield and for the lack of response to spacing was found to be the inadequacy of solar radiation especially during the reproductive phase.

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