

## YIELD POTENTIAL AND NITROGEN RESPONSE OF EARLY RICE CULTURE, 24-20

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*It is highly desirable that a variety of rice should mature in the shortest time possible; but it should be with no risk of grain yield loss attributable to earliness. The minimum duration of the rice plant for producing economically higher grain yield has not been fixed. However, it is suggested that a grain yield of 8-9 tonnes per hectare in dry season could readily be achieved with an 85 day to 100 day variety that develop leaf area more rapidly. (Anon, 1970). Studies to assess the yield potential, nitrogen response and the ancillary characteristics of the rice culture, 24-20 that was found to mature in 75 to 80 days were undertaken and the results are presented in this paper.*

### Materials and Methods

The fertilizer treatments consisted of four levels of nitrogen viz. 30, 60, 90, and 120 Kg. per hectare. The details of the trial conducted and the important morphological characters of the rice culture were reported earlier. (Kuriakose and George, 1973). The characters relating to yield studies were, height of plants, number of days to maturity, number of tillers per hill, length of main ear, number of grains on the main ear, weight of one thousand grains, yield of grain, yield of straw, grain-straw ratio, productivity of grain per day of growth, nitrogen response and optimum nitrogen requirement.

### Results and Discussion

The data on the characters observed are presented in Table

#### *Height of plants*

The influence of nitrogen in increasing the height of plants was observed from 60 Kg. onwards and the maximum height was recorded at 120 Kg. level. The mean height of plants was 74.8 cm. According to Tanaka (1964), the tall varieties rice have a small grain: straw ratio and they utilise assimilation products inefficiently in producing grain. The shortness in stature may therefore be a character that contribute to the yielding ability of the early rice culture under study.

#### *Number of days to maturity*

At 30 Kg. nitrogen level, the culture matured in the minimum period of 78.2 days. The period for maturity was more at 60 Kg. and 90 Kg. nitrogen

levels but at 90 Kg. and 120 Kg. there was no difference in the maturity period. However, the maximum period of 81 days was recorded at 120 Kg. nitrogen level. The mean number of days for maturity over all levels of nitrogen was 79.7 days.

#### *Number of tillers per hill*

The number of productive tillers per hill was maximum (10.9) at 90 Kg. level. However, the number at 90 Kg. and 120 Kg. nitrogen showed no marked difference. It was also observed that the number of unproductive tillers did not increase consequent to increased nitrogen supply. It is thus evident that the early culture has maintained its efficiency of producing productive tillers even at higher levels of nitrogen. Low nitrogen response varieties have a limited increase in panicle number whereas high response varieties exhibit a large increase with increase in nitrogen supply.

#### *Length of main ear*

The length of main ear was more at 60 Kg. than at 30 Kg. nitrogen level. But beyond 60 Kg. the influence of nitrogen in increasing the length of the main ear was not appreciable. The length of panicle was not influenced by nitrogen application beyond 50 Kg. [in the case of "Padma". (Bhaskaran, 1970). Panicle length is a varietal character and as such it is not generally affected by variations in nitrogen supply. In the present study also, the length of the main ear was not influenced by variations in nitrogen supply beyond 60 Kg., indicating that it is a varietal character of the early rice culture.

#### *Number of grains on the main ear*

The maximum number of grains per main ear (82.2) was recorded at 60 Kg. but this was on par with that produced at 90 Kg. nitrogen. A reduction in the number of grains was observed at 120 Kg. and the minimum number of grains was recorded at 30 Kg. nitrogen. The reduction in the number of filled grains under 120 Kg. nitrogen may probably be due to the larger number of spikelets formed under that level and the insufficiency of assimilates available in the plants for filling these large number of "yield containers". Studies conducted on the carbohydrate status and accumulation in the plant parts of this culture have revealed that the total carbohydrates accumulated in the plants at harvest was lower at 120 Kg. nitrogen than at 90 kg. (Kuriakose and George, 1973a).

#### *Weight of one thousand grains*

The levels of nitrogen had no influence on the weight of one thousand grains. Nair, (1968) could not observe any variations in the weight of one thousand grains in IR8 and Tainan 3. It may be possible that the weight of grains is an attribute which is not influenced by the variations in nitrogen supply in the case of early varieties also.

**Table 1**  
**Summary of grain yield and ancillary characteristics**  
**of Culture 24-20 (Dry season, 1972)**

Characters	Nitrogen levels per hectare				Mean	F test	C. D. at 0.05
	30 kg	60 kg	90 kg	120 kg			
Height of plants at harvest (cm.)	69.6	71.5	75.5	82.2	74.8	Sig	2.6
2. No. of days to maturity		79.0	<b>80.7</b>	81.0	79.7	Sig	0.5
3. a. Number of productive tillers per hill	8.8	<b>9.7</b>	10.9	10.6	<b>10.0</b>	Sig	1.0
b. Number of unproductive tillers per hill	2.1	1.9	2.5	2.5	2.3	N. S.	
4. Length of main ear (cm.)	17.8			19.1	18.6	Sig	0.7
5. Number of grains on the main ear	69.8	82.2	<b>80.3</b>	75.8	<b>77.0</b>	Sig	4.8
6. Weight of one thousand grains (gm.)	28.76	28.42	28.86	29.03	28.76	N. S.	
7. Grain yield (kg) per hectare	3569.00	5079.00	5559.00	4461.00	4667.00	Sig	411.8
8. Straw yield (kg) per hectare	3638.00	4393.00	4736.00	5010.00	4444.00	Sig	617.7
9. Grain-straw ratio	1.011	1.174	1.173	0.898	1.064	Sig	0.123
10. Per day productivity of grain (kg.) per hectare	45.9	64.3	<b>68.8</b>	55.3	58.6	Sig	4.6

Sig = Significant at 5 per cent level  
 N. S. = Not Significant

### *yield of grain*

A grain yield of 5559 Kg. per hectare was obtained at 90 Kg. nitrogen level and this was higher than the yield obtained at all other levels. The grain yield increased upto 90 Kg. nitrogen and decreased thereafter. Declining trend of grain yield above 90 Kg. nitrogen was reported by Kunju (1969) in the short duration variety Annapurna.

The higher grain yield produced at 90 Kg. nitrogen may be the result of a well balanced and more strengthened lamina - sheath systems of plants which prevailed at that level of nitrogen during the flowering stage. The lower grain yield recorded at lower levels and the yield decline at 120 Kg. level may be due to the insufficient or excessive quantitative development of lamina at flowering as observed from the studies on dry matter production of plant parts (Kuriakose and George, 1973). Higher grain yield at 90 Kg. nitrogen may also be due to the combined contribution and better disposition of the productive attributes like number of productive tillers, number of grains per ear and weight of one thousand grains at that level.

The fact that the culture has given a moderately higher grain yield of 5079 Kg. per hectare under 60 Kg. nitrogen level indicate that very early varieties can play an important role in the context of limited availability of nitrogenous fertilizers.

### *Yield of straw*

A maximum straw yield of 5010 Kg. per hectare was obtained at 120 Kg. N. However this was not significantly different from the straw yield at 90 and 60 Kg. nitrogen. Maximum straw yield has been observed in Annapurna at 120 Kg. Nitrogen. (Ahammad, 1970).

### *Grain-straw ratio*

The highest grain-straw ratio of 1.174 was recorded at 60 Kg. and this was on par with that at 90 Kg. nitrogen. The grain-straw ratio was found to be smaller at 120 Kg. Early maturing varieties usually have a grain straw ratio of about one and late maturing varieties have a low grain straw ratio. (Chandler, 1963). According to Tanaka *et al.* (1958), the grain-straw ratio in low response varieties is small, and this becomes even smaller with nitrogen application.

### *Productivity of grain per day of growth*

The grain production per day of growth was found to be the maximum (68.8 Kg. per hectare) at 90 Kg nitrogen. According to Nair (1968) the per day productivity of grain of IR8 in the main field was 67.5 Kg. at 100 kg nitrogen. This indicate that the per day productivity of the culture 24-20 is as high as that of IR8. The possibility of securing higher grain yield with 80 day varieties is also apparently indicated.

### *Nitrogen response and optimum nitrogen requirement*

The response curve of nitrogen is worked out and presented.

$$Y = 6.0725 + 1.0217 N - 0.0062 N^2$$

The optimum level of nitrogen was found to be 82.35 Kg. per hectare. Compared to the optimum requirement of nitrogen over 100 Kg. per hectare for IR8, the nitrogen requirement of this early culture is considerably low.

### **Summary**

The yield potential, nitrogen response and the ancillary characteristics of the early rice culture, 24-20 that matured in 75-80 days under Vellayani conditions were studied in relation to four levels of nitrogen fertilization.

The maximum grain yield of 5559 Kg. per hectare was obtained at 90 Kg nitrogen level. The maximum productivity of the early culture was 68.8 Kg. per hectare per day indicating that a moderately higher grain yield could be obtained with varieties of 80 day duration. The optimum nitrogen requirement was found to be 82.35 Kg. per hectare. The important role of very early varieties in the context of limited availability of nitrogenous fertilizers is also indicated.

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സംഗ്രഹം

75 മുതൽ 80 വരെ ദിവസങ്ങൾ മാത്രം മുപ്പുള്ള 'കൽപ്പർ 24-20' എന്ന ഇനം നെല്ലിന് നാലു തോതുകളിൽ നൈട്രജൻ നൽകി വിളവിന്റെ രീതി പരിശോധിച്ചതിൽ ഹെക്ടാർ ഒന്നിന് 90 കി. ഗ്രാം എന്ന തോതിൽ നൈട്രജൻ നൽകിയ പ്ലോട്ടുകളിൽ ഏറ്റവും കൂടുതൽ വിളവുണ്ടായതായി കണ്ടു. (5559 കി. ഗ്രാം) എൺപതു ദിവസം മുപ്പുള്ള ഇനത്തിന് അല്പം വിളവു കൂടുതൽ കിട്ടുമെന്നും തെളിഞ്ഞു. ഹെക്ടാറിന് 82.35 കി. ഗ്രാം നൈട്രജൻ എന്നതായിരുന്നു ഏറ്റവും നല്ല തോതു്. വളത്തിനുള്ള ദുർലഭ്യം കണക്കിലെടുത്താൽ മുപ്പു കുറഞ്ഞ വിത്തിനങ്ങൾ ഉപയോഗിക്കുന്നതിലുള്ള മേന്മ ഈ പരീക്ഷണങ്ങൾ സൂചിപ്പിക്കുന്നു.

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