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Response of Drill Sown Rainfed Rice Genotypes to Seed Rate and Fertility Levels

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Abstract : Two medium and two early rice genotypes were evaluated for their productivity and response to seed rate and fertility levels, against respective checks during 1990 and 1991 at the Agricultural Research Station, Mugad, under rainfed drill sown conditions. Medium duration genotype IET–5909–15–5 was superior to the check Avinash due to superior grain and straw yields and fine grain quality. The new early genotypes IET–7991–11–2 and IET–7564–4–3 however recorded on par grain and straw yields but had the ability to escape the possible drought at the later stages of crop growth due to their earliness when compared to the check Rasi. For all the genotypes tested, 100 kg seeds per ha and 100–50–50 kg $N–P_2O_5–K_2O$ per ha fertiliser level was found optimum.

Introduction

The new rice genotypes developed vary in their duration, canopy structure, tillering habit, grain to straw ratio and yield. Hence there is likelihood of difference in the seed rate and nutritional requirement of these new genotypes. When early genotypes are developed, accepting some grain yield reduction (Ravikumar *et al.*, 1989) or with no reduction in grain yield but some reduction in total dry matter production, there is possibility of reduction in nutrient requirement. Low tillering genotypes may respond to higher seed rate and *vice versa* (Ramesh *et al.*, 1988). If the new genotypes are high yielding than the existing ones, they may respond to higher nutrient levels (Venkateshwara Reddy and Sreeramamurthy, 1985). Therefore, the present investigation was undertaken to evaluate the productivity and find out the specific seed rate and nutrient requirements of the new rice genotypes developed for rainfed drill sown conditions of Karnataka.

Material and Methods

A field experiment was conducted in a split plot design at the Agricultural Research Station, Mugad, Karnataka during *kharif* season of 1990 and 1991 under rainfed conditions with three replications. The soil was silty clay loam with pH 7.2, organic carbon 0.21%, available P_2O_5 20 kg/ha and available K_2O 500 kg/ha.

The treatments consisted of six rice genotypes, *viz.* IET–5909–15–5, KMS–5914–4–6, IET–7991–11–2, IET–7564–4–3, Avinash and Rasi with seed to seed duration of 150,145,110,105,140 and 130 days, respectively under main plot. Avinash and Rasi were the released checks for medium (IET–5909–15–5 and KMS–5914–4–6) and early (IET–7991–11–2 and IET-7564–4–3) duration genotypes, respectively. During 1990, sub plot treatments were seed rates (75 and 100 kg/ha) and sub–sub–plot treatments were fertility levels (100–50–50 and 133–66.5–66.5 $N–P_2O_5 – K_2O$ kg/ha). Only three fertility

levels were included as sub plot treatments during 1991 (67–33.5–33.5, 100–50–50 and 133–66.5–66.5 N–P_2O_5 – K_2O kg/ha).

The experiment was sown on 30th May and 4th June and the total rainfall received during crop season was 949 and 1197 mm in 74 and 73 rainy days during 1990 and 1991, respectively.

Results and Discussion

The grain and straw yields and yield components of rice genotypes as affected by seed rate and fertility levels have been presented in the Table 1. The new medium duration, rice genotype IET–5909–15–5 recorded significantly higher grain yield than the check (Avinash) during 1990 only. But for this, there was no significant difference between any new genotypes and the respective check during both the years. Straw yield also did not differ significantly between the new genotypes and the respective checks during both the years, except between those of new medium duration genotypes IET–5909–15–5 and KMS–5914–4–6 and the check Avinash during 1990. In the medium duration group, panicles per m^2 did not differ significantly between new genotypes and the check during both the years. The lower 1000 grain weight of new genotypes compared to that of check was compensated by higher mean panicle weight. Whereas in the early duration group significant differences were observed in the panicles per m^2 between the new genotypes IET–7991–11–2 and IET–7564–4–3 and the check Rasi only during 1990. New genotypes recorded less panicles per m^2 than the check. Higher grain weight of new genotypes was perhaps compensated by the comparatively higher mean panicle weight of Rasi. Variation in the grain yield between rice genotypes was reported by Narasimha Rao *et al.* (1989), Ravikumar *et al.* (1989) and Venkateshwara Reddy (1985) due to fertilizer response and change in duration.

Grain and Straw yields were higher when 100 kg seed rate per ha was used during 1990. The increased yield might have been due to the comparatively higher number of panicles per m^2 with higher seed rate as reported by Ramesh *et al.* (1988).

Grain and straw yields were significantly increased with the increase in fertilizer level from 67.33–5–33.5 to 100–50–50 kg N –P_2O_5–K_2O per ha during 1991. Increase in fertiliser level beyond 100–50–50 kg N–P_2O_5–K_2O per ha had no significant effect either on grain yield or on straw yield during both the years. The increased yield with 100–50–50 kg N–P_2O_5–K_2O per ha were mainly due to increased number of panicles per m^2. The favourable response to NPK fertilizers is in conformity with the results of Ramesh *et al.* (1988) and Venkateswara Reddy and Sreeramamurthy (1985).

Interaction effect was not significant between any two factors with respect to any parameter during both the years. The lack of interaction between the genotypes and seed rate could be attributed to the receipt of sufficient and well distributed rain–fall during 1990 which encouraged tillering and resulting in lack of differential response between genotypes. Venkateswara Reddy and Sreeramamurthy (1985) have reported significant interaction between rice varieties and fertilizers. Lack of puddling and occurence of flash floods in drill sown rainfed rice, which leads to more seepage and runoff loss of applied nutrients might be probably the reason for lack of differential response of genotypes to fertility levels in the present study.

It could be concluded that for all the new rice genotypes tested, use of 100 kg seeds per ha and the application of 100–50–50 kg N–P_2O_5– K_2O per ha is sufficient for getting higher yields. Medium duration genotypes IET–5909–15–5 and KMS–5914–4–6 are equally high yielding and preferable to Avinash because of finer grain quality. Early genotypes

Table 1. Yield components, grain and straw yields of rice genotypes as affected by seed rate and fertility levels

Treatment	Panicles / m²			Mean panicle weight (g) 1991	1000 grain weight (g)			Grain yield (t/ha)			Straw yield (t/ha)		
	1990	1991	Mean		1990	1991	Mean	1990	1991	Mean	1990	1991	Mean
Genotypes													
IET–5909–15–5	278	522	400	4.8	18.6	15.3	17.0	6.013	6.121	6.067	10.919	8.519	9.719
KMS–5914–4–6	256	501	379	4.3	17.2	14.4	15.8	4.664	6.163	5.414	7.181	8.272	7.727
IET–7991–11–2	441	657	549	2.7	25.2	27.3	26.3	3.310	4.047	3.679	3.850	5.391	4.621
IET–7564–4–3	412	680	546	2.9	22.2	24.8	23.5	3.589	3.997	3.783	4.381	5.926	5.154
Avinash	278	543	411	3.5	27.7	23.9	25.8	4.954	5.604	5.279	9.463	5.103	7.283
Rasi	296	661	479	3.1	18.9	23.4	21.2	3.258	4.450	3.854	4.865	5.391	5.128
C.D. (0.05)	97	125	—	1.0	2.2	1.0	—	0.972	0.644		3.009	1.572	—
Seed rate (kg/ha)													
75	315	—	315	—	21.7	—	21.7	4.011	—	4.011	6.280	—	6.280
100	338	—	338	—	21.6	—	21.6	4.585	—	4.585	7.273	—	7.273
C.D. (0.05)	NS	—	—	—	NS	—	—	0.520	—	—	0.873	—	—
Fertilizer ($N–P_2O_5–K_2O$ kg/ha)													
67–33.5–33.5	—	538	538	3.5	—	21.5	21.5	—	4.732	4.732	—	5.330	5.330
100 –50 – 50	315	630	473	3.6	21.7	21.7	21.7	4.047	5.224	4.636	6.374	6.729	6.552
133–66.5 – 66.5	339	614	477	3.5	21.6	21.3	21.5	4.549	5.224	4.887	7.179	7.243	7.211
C. D. (0.05)	24	55	—	NS	NS	NS	—	NS	0.287	—	NS	0.637	—

NS = Not significant

IET–7991–11–2 and IET–7564–4–6 are also equally high yielding and can be preferred to Rasi because of their earliness and the ability to escape drought at the later stage of crop growth, commonly seen in rainfed uplands.

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