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STUDIES ON NITROGEN MANAGEMENT IN RELATION TO QUALITY GRAIN AND YIELD IN LOWLAND IRRIGATED RICE

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Studies conducted in rice with Ratna (early), Prakash (medium) and Phalguna (late) varieties during 1984 kharif season at different nitrogen levels (0, 50, 100, 150 and 200 kg N/ha) indicated that increased level of nitrogen contributed to higher yields but reduced the production of quality (high density) grain. The 1000 grain wt was unaffected at all nitrogen levels. Wider differences observed between average and potential test weight of Ratna and Prakash and meagre difference in Phalguna indicate the extent of possible variation in grain filling pattern among varieties of different duration in relation to nitrogen levels. Higher yield recorded at higher 'N' was attributed to increased production of varied yield componcnts such as panicle number, spikelet and grain number, as influenced by dry matter, leaf area index reflecting in higher photosynthetic efficiency. The study indicated that varieties possessing higher amount of high density grain (quality grain) are suitable for low 'N' management.

Paddy being an important crop and consumed as a whole kernel, the nature of grain filling is considered to be an important character to be investigated. Grain filling is a complex process involving photosynthesis, translocation and conversion of soluble photosynthates to solid form contributing to size and grain in the present study refers to 'filled grain' or high density grain (Padmaja Rao and Venkateswarlu, 1985). Since yield potential in a variety is dependent on grain size (1000 grain weight) number and the quantum of filling (percent of ripening), efforts were i e current st d to

grain as influenced by nitrogen levels as nitrogen being the major nutrient considered for increasing rice yields (Ayyaswamy *et al.*, 1983). The study obviously infers the role played by nitrogen in the production of high density grain and also in influencing grain yield of rice.

MATERIALS AND METHODS

An experiment was conducted at the Directorate of Rice Research, Rajendranagar farm during kharif 1984 with Ratna (early), Prakash (medium) and Phalguna (late) varieties with five nitrogen levels *viz.*, 0, 50, 100, 150 and 200 kg N ha. Initially 50% N was applied as a basal dose at 10 days after transplanting followed by top dressing at maximum tillering (25%) and panicle initiation (25%) stages. The seedlings were planted with aspacing of 20 × 10 cm and the experiment had a randomized block design with four replications. The total dry matter and leaf area index (LAI) were recorded at panicle initiation and flowering stages. At maturity, the number of tillers, panicles, spikelets, grains, 1000 grain weight and grain yield were recorded.

From the panicles collected at harvest, the high density grain from each treatment (50 panicles) was assessed by immersing the seeds in salt solutions of 1.18 specific gravity (270 g Nacl/1 1 H20) and the immersed seed was calculated as percent (high density grain index) against the total number of spikelets (Padmaja Rao, *et al.*, 1985). Proportions of different grades of rain

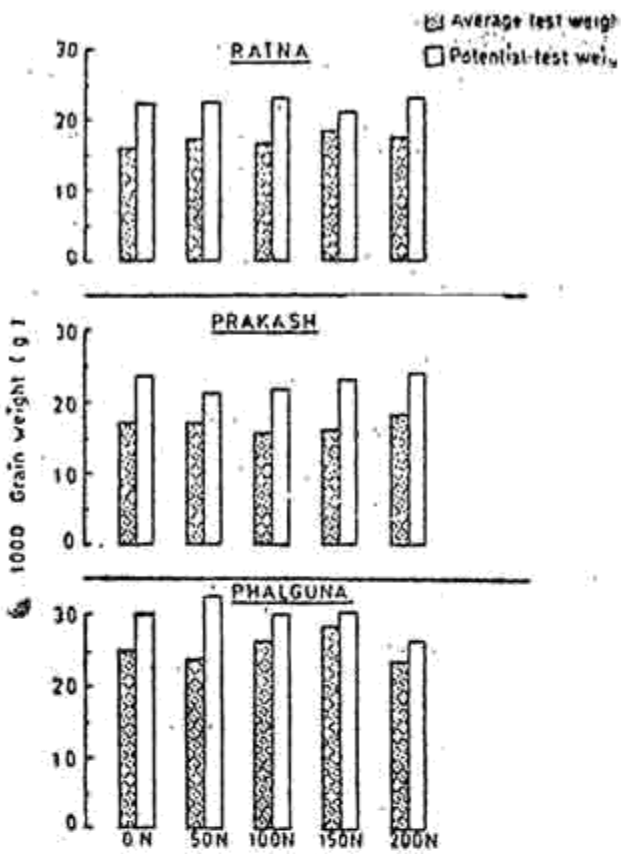

Fig. 1 - AVERAGE AND POTENTIAL TEST WEIGHTS OF RICE VARIETIES AT DIFFERENT NITROGEN LEVELS

solutions. Grains floated in water (wi no salts) were grouped as chaff a partially filled, while those floated solutions with specific gravity 1.06 a 1.18 were considered as average a good grade grains. Grain immer in 1.18 sp. gr solution and above we rated as very good (high density grai grade.

RESULTS AND DISCUSSION

The results indicated that nitroge has not shown any influence on th production of high density grain in a the varieties tested irrespective of t duration. The high density grain inde (percent of very good grain over th total number of spikelets formed) di not show positive relationship to highe

Proportions of different grades of grain (%) as Influenced by nitrogen levels among the varieties

grain	RATNA					PRAKASH					PHALGUNA				
	ON	50N	100N	150N	200N	ON	50N	100N	150N	200N	ON	50N	100N	150N	200N
	20.7	20.3	24.6	29.0	32.1	18.2	13.2	17.9	18.4	21.6	18.8	16.5	14.6	17.3	18.7
led	6.2	5.4	9.4	4.7	6.7	9.7	7.5	6.1	10 0	9.0	8.2	7.1	10.4	8.1	8.8
ain	1.0	1.2	1.4	1.7	1.6	1.4	1.1	1.1	1.7	1.4	2.0	2.0	1.8	2.0	1.9
	5.1	7.1	8.8	10.5	10.1	12.5	8.2	6.4	9.5	10.3	12.4	10.9	14.7	14.6	19.3
ty grain	67.0	66.0	55.8	54.1	49.5	58.2	70.0	68.5	60.4	57.7	58.6	63.5	58.5	58.0	51.3

nfluence of 'N' levels on grain grade index and yield components

N level	Grain grade index (%)	Tiller No. / sq.m	Panicle No./ sq.m	Spikelet No./ sq.m	Grain yield t/ha	Days to 50% flowering	Days to maturity	Leaf area index(LAI)		Total dry matter (g)		1000 grain wt (g)
								P. I.	FI.	P. I.	FI	
0	67.0	375	368	34,350	6.5	87	119	1.6	3.2	268	550	16.0
50	66.0	386	380	38,800	7.3	87	119	1.7	3.0	295	658	16.2
100	55.8	448	440	43,120	7.7	88	119	2.3	3.6	390	808	16.3
150	54.1	465	460	52,950	8.7	89	123	2.6	4.1	409	683	16.5
200	49.5	508	503	54,530	9.2	90	124	2.0	3.7	421	776	16.4

	CD (5%)	—	12.54	7.64	2290	0.54	—	—	NS	NS	NS	NS	—
	CD (1%)	—	17.58	10.70	3210	0.75	—	—	NS	NS	NS	NS	—
	CV (1%)	—	1.87	1.15	3.32	4.41	—	—	29.44	33.05	24.69	23.61	—
›H	0	58.2	273	265	31,400	6.4	115	147	1.8	2.4	258	494	17.1
	50	70.0	308	300	34,990	6.6	116	147	2.0	3.4	348	655	17.2
	100	68.5	313	320	38,060	6.9	117	150	2.2	3.5	320	699	17.3
	150	60.4	358	350	38,270	7.0	119	154	2.9	4.0	430	650	17.2
	200	57.7	368	360	39,100	7.9	119	155	2.4	3.9	484	714	17.2
	CD (5%)	—	11.39	12.08	1504	0.73	—	—	NS	NS	68.11	NS	—
	CD (1%)	—	15.96	16.94	2109	1.00	—	—	NS	NS	95 49	NS	—
	CV (1%)	—	2.28	2.46	2.69	6.78	—	—	30 95	38.46	12.02	16.66	—
UNA	0	58.6	273	268	24,500	6.0	127	158	1.7	3.7	236	741	23.7
	50	63.5	310	305	22,240	6.2	127	159	2.3	6.6	333	858	23.7
	100	58.5	323	318	23,910	6.3	128	159	2.4	5.4	307	1003	23.8
	150	58.0	390	383	23,230	6.3	128	165	2.4	6.3	251	1148	24.0
	200	51.3	403	398	35,38	7.8	129	166	2.7	8.5	335	1219	23.7
	CD (5%)	—	6.30	8.50	1683	0.26	—	—	NS	1.66	NS	152.7	—
	CD (1%)	—	8.83	11.98	2359	0.36	—	—	NS	2.32	NS	214.0	—
	CV (1%)	—	1.20	1.66	4.22	2.57	—	—	23.74	17.70	19.58	9.97	—

Panicle initiation; Fl = Flowering

observed between average and potential test weight of grains (1000 grain weight of very good grade grain) among the varieties indicate that further filling of grains with photosynthates is likely to occur (Fig. 1). The differences were more in early and medium varieties (Ratna and Prakash) and marginal in late variety (Phalguna) at hige 'N' level. It was observed that the increased number of tillers, panicles and the grain yield were positively influenced by increased 'N' level (Table 2).

Days to flowering was unaffected with 'N' level while days to maturity increased by 5-8 days at higher levels of 'N' application. The proportionate increase in LAI and total dry matter as influenced by higher levels of 'N' application seemed to have contributed to higher photosynthetic efficiency. The probable reason for the negative relationship of high density grain production af higher 'N' level was attributed primarily to accumulation of dry matter in the vegetative parts like leaves and stem. It was also possible that photosynthates were not proportionately filled in the increased number of spikelets formed in the panicle causing a limitation in the formation of potential sink size. The increased yields were due to the influence of 'N' on excessive tiller production, panicle formation, leaf area index (LAI), accumulation of dry matter, number of spikelets, grains and similar other yield contributing factors. In other words, the study suggested that the varieties possessing higher amount of high density grain are suitable for low 'N' management. Therefore, screening for varieties possessing higher amount of hige density grain is highly desirable for increasing rice production in future.

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