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EFFECT OF IRRIGATION REGIMES AND NITROGEN LEVELS ON RICE VARIETIES UNDER TRANSPLANTED CONDITION

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ABSTRACT

A field experiment was conducted to evaluate the optimum irrigation regime and effect of nitrogen levels under different moisture stress conditions on rice varieties Co 37 and Co 41 under transplanted condition. The results revealed that rice co 37 (Vaigai) was found to be more suited than rice Co 41. Irrigation to replenish 7 cm depth one day after its disappearance was found to be the best irrigation schedule for rice and nitrogen at 75 kg/ha was found to be optimum for higher grain yield.

KEY WORDS: Rice, Irrigation regimes, Nitrogen levels.

In India, rice occupies nearly 22 per cent of cultivated area. Out of this 40 per cent ie., nearly 15 m.ha is under irrigation. In Tamil Nadu rice is grown in about 2.79 m.ha, out of an area of 3.60 m.ha under irrigation. This approximately consumes 87 per cent of the available irrigation resource of the state. Although plentiful water supply is considered important for rice production, it is seldom realised that excess and improper irrigation is detrimental to yield. In order to find out optimum application of irrigation water for higher rice yields, this experiment was conducted.

MATERIALS AND METHODS

Field experiments were conducted during July, 1981 and 1982 to find out the optimum irrigation and nitrogen levels on rice grain yield at the Central Farm, Agricultural College and Research Insitute, Madurai. The soil was of sandy clay loam type with a pH 7.4. The infiltration and bulk density were 2.00 cm/hr and 1.708 cc. The available NPK status of the soil was in the order of 210, 13 and 167 kg of N, P_2O_5 and K_2O/ha respectively. In the first year of trial, the seedlings were transplanted on 26.7.80. The harvest was made on 25.10.80 (Co 37) and 27.10.80

Table 1. Effect of irrigation regimes, varieties and nitrogen levels in the number of productive tillers in rice

Varieties and Nitrogen Levels	1980-81 Irrigation Regimes							1981-82 Irrigation Regimes						
	I_1	I_2	I_3	I_4	Mean	SED	CD (0.05)	I_1	I_2	I_3	I_4	Mean	SED	CD (0.05)
V_1	8.29	8.78	8.23	8.13	8.36	0.174	0.342	10.44	9.95	9.58	9.79	9.94	0.331	0.662
V_2	6.87	6.35	5.83	5.93	6.25			9.16	9.22	8.83	9.81	9.25		
Mean	7.58	7.57	7.03	7.03				9.80	9.59	9.20	9.80			
N_1	6,59	7.21	5.98	6.40	6.55	0.2134	0.4192	9.22	9.93	9.21	9.60	9.49	0.357	NS
N_2	7.84	7.18	6.96	7.15	7.25			9.83	9.52	9.06	9.54	9.54		
N_3	8.31	8.31	8.15	7.65	8.11			10.33	9.31	9.35	9.76	9.76		
Mean	7.24	7.24	7.01	7.02				9.80	9.59	9.20	9.80			
	0.457							0.58						
CD (0.05)	1.200							NS						

Table 2. Effect of irrigation regimes, varieties and nitrogen levels on number of filled grains per panicle

Varieties 'N' levels	1980-81 Irrigation regimes I_1	I_2	I_3	I_4	Mean	SED	CD (0.05)	Varieties 'N' levels	1981-82 Irrigation regimes I_1	I_2	I_3	I_4	Mean	SED	CD (0.05)
V_1	74.69	66.41	54.99	64.08	65.06	2.11	4.15	V_1	66.01	67.02	63.39	63.01	64.91	0.186	0.37
V_2	81.47	87.46	83.68	79.41	83.00			V_2	83.73	85.88	83.55	83.25	84.10		
Mean	78.08	76.94	69.34	71.75				Mean	74.87	76.45	73.47	73.13			
N_1	73.16	72.98	65.66	72.11	70.98	2.54	NS	N_1	74.70	76.47	73.22	72.95	74.33	0.227	NS
N_2	79.05	76.93	70.51	72.19	74.67			N_2	74.60	76.88	73.81	73.25	74.66		
N_3	82.14	80.90	71.81	70.93	76.45			N_3	75.32	76.00	73.57	73.11	74.50		
Mean	78.12	76.60	69.33	71.74					74.87	76.45	73.56	73.10			
SED	11.75								0.22						
CD (0.05)	NS								0.50						

(Co 41). In the second year of trial, seedlings were transplanted on 21.8.81. The crop was harvested on 1.11.81 and 5.11.81. The water was gauged through 90°C 'V' notch. The trial was laid out in a split plot design. Irrigation regimes were allotted to main plot and combination of two varieties and three levels of nitrogen to sub-plots. The irrigation treatments comprised of continuous submergence to 5 cm throughout crop period (I_1), irrigation to a depth of 7 cm one day after the disappearance of ponded water (I_2), irrigation to a depth of 7 cm three days after the disappearance of ponded water (I_3) and irrigation to a depth of 7 cm five days after its disappearance (I_4). The rice varieties Co 41 (V_1) and Co 37 (V_2) were tested under three levels of nitrogen namely 75 kg (N_1), 100 kg (N_2) and 125 kg (N_3) per ha.

RESULTS AND DISCUSSION

Ear bearing tillers

Irrigation regimes, varieties and nitrogen levels had significantly influenced the earbearing tillers (Table 1). Among the irrigation regimes, irrigation at continuous submergence to 5 cm depth throughout crop period registered more number of earbearing tillers as compared to the other treatments tried, but it was on par with irrigation to 7 cm one day after the disappearance of ponded water (I_2). Between the varieties, Co 41 produced significantly more number of earbearing tillers than Co 37 indicating its superiority over Co 37. Among the nitrogen levels, 125 kg N/ha showed significant influence on productive tillers followed by N at 100 kg N/ha.

During 1981-82 trial, irrigation regimes and nitrogen levels did not exert any significant influence on the earbearing tillers. But between the varieties, the Co 41 recorded highest number of earbearing tillers (9.94) than rice Co 37 (9.25).

Interaction between irrigation and varieties and between varieties and nitrogen levels had significantly influenced the number of grains per panicle. Co 37 recorded highest number of grains per panicle in irrigation to 7 cm depth one day after the disappearance of ponded water than other treatments tried. Co 37 recorded the greatest number of grains per panicle under 100 kg N/ha.

Table 3. Effect of irrigation regimes, varieties and nitrogen levels on yield of rice varieties (kg/ha)

Irrigation Regimes, varieties and 'N' levels	1980							1981						
	I_1	I_2	I_3	I_4	Mean	SED	CD (0.05)	I_1	I_2	I_3	I_4	Mean	SED	CD (0.05)
V_1	6170	5981	5418	5104	5668	134	269	3288	2934	2996	3166	3346	75	149
V_2	7018	7332	6942	6230	6881			4604	4835	4190	3982	4403		
Mean	6594	6656	6180	5667				3946	4384	3593	3574			
N_1	6287	5809	5921	5532	5887	165	329	3763	4311	3507	3532	3778	90.13	NS
N_2	6385	6743	5876	5652	6164			3641	4604	3544	3532	3830		
N_3	7110	7416	6743	5816	6771			3751	4250	3751	3666	3855		
Mean	6594	6656	6180	5667										
SED	78							93						
CD(0.05)	205							210						

Number of grains per panicle

The number of grains per panicle was not influenced by any of the treatments except variety in which rice Co 37 produced significantly more number of grains than in rice Co 41 (Table 2). Nitrogen levels showed linear trend with increase in grain number with increase in nitrogen levels.

In the second year trial, Irrigation regimes and varieties had significantly influenced the number of grains per panicle. But the nitrogen levels did not significantly influence the number of grains per panicle. Between the rice varieties, the rice Co 37 recorded greater number of grains per panicle than rice Co 41.

Among the irrigation regimes, irrigation to 7 cm depth one day after the disappearance of ponded water recorded highest grains per panicle followed by continuous irrigation to 5 cm depth throughout the crop period. The least number of grains per panicle was obtained in treatment irrigation to 7 cm depth five days after the disappearance of ponded water.

Grain yield

During 1980, irrigation schedule at replenishing water to 7 cm depth one day after the disappearance of ponded water (I_2) recorded highest grain yield than other regimes tried (Table 3). However it was on par with irrigation scheduled to maintain continuous submergence of 5 cm throughout the crop period (I_1). The yield of grain was reduced significantly when moisture stress was prolonged to three days after the disappearance of ponded water (I_3). This is in accordance with Jha et al. (1981) who reported that scheduling 7 cm irrigation 2 days after the disappearance of ponded water resulted in higher paddy yields similar to those obtained with continuous or partial flooding

Between the rice varieties, Co 37 recorded significantly higher grain yield than Co.41 the yield increase being 17.6 per cent.

Nitrogen levels

The different nitrogen levels had significant influence over the grain yield. Nitrogen at 125 kg/ha recorded the highest grain yield of 6771 kg/ha. However nitrogen at 75 and 100 kg/ha were on par with each other producing 5887 kg and 6164 kg of grain per ha respectively (Table 3). This is in accordance with Talha et al. (1981) who

Table 4. Water use efficiency by the different irrigation regimes

Irrigation Regimes	Grain yield (kg/ha)		Total Water used (cm)		Water use Efficiency (kg/ha cm)	
	1980-81	1981-82	1980-81	1981-82	1980-81	1981-82
I_1	6594	3946	128	159	51.51	24.81
I_2	6656	4384	104	149	63.92	29.42
I_3	6180	3593	82	136	75.39	26.41
I_4	5667	3568	122	159	46.63	22.44

reported that the grain yield increased with increasing fertilizer treatment and increasing water depth.

Irrigation regimes

Irrigation to maintain continuous submergence of 5 cm throughout the crop period (I_1) consumed the maximum of 128 cm of water. The water used in irrigation to 7 cm depth, one day, three days and five days after disappearance of ponded water was 104, 82 and 122 cm respectively. When irrigation was scheduled at 5 days after its disappearance, the quantity of water per irrigation was more than in the treatments I_2 and I_3 due to higher moisture depletion from the soil; hence the quantity consumed was more or less equal to that of I_1. Since irrigation to 7 cm depth one day after its disappearance (I_2) recorded highest grain yield with a saving of 18.7 per cent in irrigation water over other treatments tried, I_2 treatment may be preferred. The interaction between irrigation regimes and nitrogen level did not significantly influence the quantity of irrigation water used (Table 4).

Water use efficiency

The water use efficiency was maximum (75.39 kg grain/ha cm) for the irrigation schedule to 7 cm depth three days after the disappearance of ponded water, followed by irrigation to a depth of 7 cm one day after disappearance of ponded water (63.92 kg/ha cm). Irrigation to 7 cm five days after disappearance of ponded water was the least in its water use efficiency. During 1981 also, the trend was similar. Jha et al. (1981) also reported that scheduling 7 cm irrigation 2 days after disappearence increased water use efficiency by 49 to 77 per cent.

The results of the field experiments conducted indicate that Co 37 was more suited to transplanted condition during first season in the Periyar Vaigai Command Area than Co 41. Irrigation to replenish 7 cm depth of water one day after the disappearance of ponded water was found to be the best irrigation schedule for rice and nitrogen at 75 kg/ha was found to be sufficient for higher grain yield.

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