Madras Agric. J., 82(2): 105-108 February, 1995
https://doi.org/10.29321/MAJ.10.A01138

WATER MANAGEMENT AND NITROGEN LEVELS ON RICE VARIETIES UNDER DIRECT SOWN CONDITION

S.D. SUNDARSINGH A. PALCHAMY A. RAJAGOPAL and S. RAMIAH
Water Technology Centre, Tamil Nadu Agricultural University, Coimbatore 641 003.

ABSTRACT

Field experiments were conducted at the Agricultural College and Research Institute, Madurai for two years (1980 and 1981) during *Kharif* season to study the effect of different water management practices at three levels of nitrogen on Co 37 *(Vaigai)* and Co 41 varieties of rice. The results revealed that Co 37 was found suitable for direct sowing in puddled soil. Irrigation to replenish 7 cm depth one day after the disappearance of ponded water was found optimum and resulted in a saving of 26 per cent in irrigation water compared to continuous submergence upto 5 cm depth throughout crop period. Application of 100kg N ha^{-1} was sufficient to produce higher grain yield than 75 and 125 kg N ha^{-1}.

KEY WORDS : Water, Nitrogen Levels, Direct Sown Rice

Judicious water management in rice is essential in utilising the water more economically without affecting the yield. Continuous standing water in rice fields leads to wastage of scarce irrigation water. Chinnaswami and Ramaswamy (1978) concluded that irrigation once in three days to replenish 5 cm submergence was found to be economical under clay loam soil condition. Recouping 5cm submergence once in 96hr was reported to be optimum for rice during monsoon season (Kaliappa *et al.*, 1974). However, information on the effect of moisture stress on the yield of rice is inadequate and it could be of practical value in distribution of irrigation water especially in the canal command area. Due to vagaries of monsoon, the release of water for irrigation in the Periyar-Vaigai command becomes erratic and uneven. With the result, raising of nursery and planting for the first crop season (June - September) become delayed. Under such condi tions direct sowing of sprouted paddy seeds over puddled soil would enable the farmers to cultivate rice in time. Therefore, the present investigation was undertaken to study the effect of direct seeding of rice on puddled soil under different water management practices and nitrogen levels.

MATERIALS AND METHODS

Field experiments were carried out at the Agricultural College and Research Institute, Madurai during *Kharif* season for two year, 1980 and 1981, to study the effect of different irrigation regimes and nitrogen levels on rice varieties sown directly on puddled soil.

The soil was sandy clay loam. The soil pH was 7.4; EC 1.9 $ds.m^{-1}$ and bulk density 1.57 $g.cc^{-1}$. The hydraulic conductivity and infiltration rate were 8.0 and 2.0 cm hr^{-1} respectively. The available status of N, P_2O_5 and K_2O was in the order of 180, 12 and 174 kg ha^{-1} respectively.

The experiments were laid out in a split-plot design with four irrigation regimes allotted to main plot and combination of two varieties and three levels of N allotted to sub-plots.

The four irrigation regimes tried were:

i) continuous submergence of 5 cm throughout crop period (I_1)
ii) irrigation to 7cm depth one day after disappearance of ponded water (I_2)
iii) irrigation to 7cm depth three days after disappearance of ponded water (I_3)
iv) irrigation to 7cm depth, five days after disappearance of ponded water (I_4)

Co 37 and Co 41 rice varieties were tried under 75, 100 and 125 kg N ha^{-1} All the treatments were replicated three times.

RESULTS AND DISCUSSION

Grain yield (1980)

Grain yield was significantly influenced by the irrigation regimes. Irrigation to replenish 7 cm water one day after the disappearance (I_2) has recorded maximum grain yield of 7726 $kg.ha^{-1}$ (Table 1) compared to other irrigation regimes. The increased yield may be due to the favourable conditions prevailed under I_2 regime resulting

Table 1. Effect of irrigation regimes and N levels on grain yield of rice varieties (kg ha^{-1})

Rice Variety (V)	Irrigation regimes (I)				Mean
	I_1	I_2	I_3	I_4	
			1980		
Co 41	6454	7192	6439	5981	6517
Co 37	7466	8259	7481	6763	7492
Nitrogen (kg ha^{-1})					
75	6347	7371	6504	5929	6538
100	6945	7558	6706	6325	6884
125	7588	8231	7670	6863	7584
Mean	6960	7726	6960	6372	
	I	V	N		
SE_D	179.5	76.3	95.8		
CD (5%)	471.5	152.4	191.3		
			1981		
Rice variety					
Co 41	3175	3414	2990	2840	3105
Co 37	6364	7476	6579	5120	6534
Nitrogen (kg ha^{-1})					
75	4112	5156	3985	3009	4066
100	5203	5493	5129	4452	5069
125	4995	5684	5241	4482	5101
	I	V	N		
SE_D	270.0	344.0	421.3		
CD (5%)	500.0	688.0	842.6		

better aeration and nutrient uptake. Brown *et al.* (1979) and Iruthayaraj and Morachan (1980 a, 1980 b) observed that intermittant irrigation not only saves water but also enhances the uptake of nutrients and grain yield. Continuous submergence (I_1) was on par with irrigation to replenish 7 cm three days after the disappearance of ponded water (I_3) both recording 6960 kg ha^{-1} of grain. The lowest yield was (6372 kg ha^{-1}) obtained in plots irrigated to 7cm depth five days after the disappearance of ponded water (I_4). This may be due to the development of cracks in the I_4 treatment plots resulting in movement of water and nutrients down beyond the root zone of the crop.

Among the two rice varieties, Co 37 was found more suitable for direct sown condition, than Co 41. The yield increase in C0 37 was 15 per cent more than Co 41.

Regarding N application, there was significant yield increase for every incremental level of nitrogen application, thus exhibiting linear response. Grain yield obtained at 125 kg N ha^{-1} (7588 kg ha^{-1}) was significantly higher than at 75 and 100 kg N.ha^{-1}, possibly because of the greater availability and uptake of N under 125 kg N ha^{-1} level.

Straw yield

Straw yield was not influenced significantly by the irrigation regimes (Table 2). Nitrogen at 125 Kg.ha^{-1} recorded the highest straw yield than the other two levels. However, the straw yeild at 75 and 100 Kg N ha^{-1} was on per. Rice Co 41 produced significantly more straw than Co 37.

Water use

The Water use under continuous submergence of 5cm throughout crop period (I_1) was maximum (117cm) followed by irrigation at I_4. The increase in water requirement in I_1 and I_4 treatments may be due to the fact that more water was required to maintain continuous ponding of 5 cm depth in I_1 and the water loss to deep layer of soil due to the development of cracks in I_4 treatment.

The water used was the lowest in I_3 treatment than in I_2 (Table 3). But irrigation treatment I_2 resulted in higher yield and water economy (11.1 per cent) than I_1 treatment.

Table 2. Effect of irrigation regimes and nitrogen levels on straw yield of rice varieties (kg ha^{-1})

Variety	Irrigation regimes (I)				Mean
	I_1	I_2	I_3	I_4	
			1980		
Co 41	8424	9231	9111	8792	9156
Co 37	8568	7317	6982	7284	7788
Nitrogen (kg ha^{-1})					
75	8224	8229	7500	7538	7872
100	8662	7735	7903	7454	7938
125	8601	8858	8738	9121	8830
Mean	8496	8274	8047	8038	
	I		V	N	
SED	949.8		223.5	273.7	
CD (5%)	NS		446.2	546.5	
			1981		
Co 41	6429	6250	6549	6340	6392
Co 37	8492	9271	8762	9271	8949
Nitrogen (kg ha^{-1})					
75	6773	8254	7760	7446	7558
100	7312	7715	7087	7715	7457
125	8299	7312	8119	8254	7996
Mean	7461	7760	7655	7805	
	I		V	N	
SED	1638.8		394.7	466.1	
CD (5%)	NS		1098.6	NS	

The water use efficiency was also higher in I_2 treatment closely followed by I_3 treatment and it was the lowest in I_4.

Thus the result of first year indicated that Co 37 *(Vaigai)* was found more suited to direct sown condition than Co 41, with a water management practice of ponding 7 cm depth, one day after disappearance. Nitrogen at 125 Kg N.ha^{-1} was recorded higher grain and straw yield over 75 and 100 kg N.ha.

Grain yield (1981)

In the second year of experimentation also, I_2 irrigation regime registered higher grain yield. The grain yeild obtained under Ii regime was comparable with I_3. Co 37 consistantly proved its superiority over Co 41 in the yielding ability. Nitrogen at 100Kg ha^{-1} recorded significantly higher grain yield over 75 kg N ha^{-1} but it was on par with 125 kg N.ha^{-1} (Table 1). The mean data of the two years also exhibited the same trend indicating the sufficiency of 100 Kg N.ha^{-1}. This is in conformity with the results of Senthivel (1981).

Straw yield

Both irrigation regimes and nitrogen levels did not evoke any significant difference in straw yield (Table 2). However, Co 37 produced higher straw yield than Co 41.

Water use

Irrigation regime I_1 consumed the highest quantity of water (141 cm) which is about 37 cm more than used under irrigation I_2. Thus there was a saving of 26 per cent in irrigation water under I_2 treatment. Subramanian and Rajagopalan (1979) also reported similar findings earlier.

Further it was calculated that the ponded water of 7cm disappeared on the fifth day and water was given one day after the disappearance and thereby the irrigation interval was 7 days. Hence this water management practice could be adopted more economically without any yield loss. The water use efficiency was also higher in I_2 irrigation regimes followed by I_3 regime and it was the lowest in I_1 regime due to higher water used (Table 3).

Table 3. Water use.

Irrigation regimes	Grain yield (kg ha^{-1})		Total water use (cm)		Water use efficiency (kg ha^{-1} cm)	
	1980	1981	1980	1981	1980	1981
I_1	6960	4770	117	141	59.5	33.8
I_2	7726	5445	104	104	74.3	52.4
I_3	6960	4785	95	102	73.3	46.9
I_4	6372	3981	112	98	56.9	40.6

Thus, considering the higher yeild, water economy and production efficiency, the results of the two years experiment revealed that rice Co 37 *(Vaigai)* was found more suitable than Co 41 for direct sown condition on puddled soil.

An irrigation schedule of replenishing 7 cm depth of water one day after the disappearance of ponded water was found quite optimum during *kharif* season. Besides, this practice would help the irrigation authorities in monitoring the distribution of water at weekly interval in the Periyar - Vaigai canal command. Application of nitrogen at 100 kg ha^{-1} was found sufficient for getting higher yield.

REFERENCES

BROWN, K.W., TURNER, F.J., THOMAS, J.C., DEVEL, L.E. and KEENER, M.E. (1979). Water balance of flooded rice paddies. **Fld. Crop Abstr., 32**: 186.

CHINNASWAMI, K.N. and RAMASWAMY, K.P. (1978). Production potential of IR 20 rice under irrigation and fertilizer constraints. **Indian J. Agron., 23**: 204-207.

IRUTHAYARAJ, M.R. and MORACHAN, Y.B. (1980) Effect of season, water management and nitrogen levels on the uptake of nitrogen by two rice varieties. **Madras agric. J., 67**: 606 - 607.

KALIAPPA, R., VENKATACHALAM,S., NACHIAPPAN, K.N., SELVARAJ, K.V. and RAMASWAMY,K.P (1974). Study of efficient use of water for rice under LBP command area. **Madras agric. J., 61**: 273 - 276.

SENTHIVEL, S. (1981). Studies on the effect of different levels of nitrogen and tanksilt under different irrigation regimes on growth and yield of rice Oryza sativa L.) variety Vaigai (co 37). M.Sc. (Ag.) Thesis. Tamil Nadu Agricultural University, Coimbatore.

SUBRAMANIAN, S. and RAJAGOPALAN, K. (1979). Water management for low land rice. **Madras agric.J., 66** 370-375.

Madras Agric. J., 82(2): 108-112 February, 1995

YIELD AND HIGH DENSITY GRAIN AS INFLUENCED BY CROP DENSITY AND 'N' LEVEL IN SCENTED RICE

S.PADMAJARAO

Department of Plant Physiology, Directorate of Rice Research, Rajendra Nagar, Hydarabad 500 030

ABSTRACT

Field studies were conducted with 2 scented rice varieties (Basmati-370 and IET 8580) during *kharif* and *rabi* (1988-89) by adopting different 'N' levels (0,20,40,60 and 80) and 3 spacings (20x10; 20x15 and 20x20 cm) to assess the nature of 'N' and density of population influencing yield and high density grain. High density grain number was prominently high at 40 kg N/ha in both the seasons and further increase reflected in excessive vegetative growth and lodging during wet season. The yield and HD grain number were relatively higher during dry season. Overall, the study inferred that for exploiting potential yields and high density grain in scented rice, an optimum population of 50 hills/m^2 at 40-60 N would be sufficient.

KEYWORDS : Yield, High Density Grain, N level, Scented Rice

Scented rices have got great demand in international and national markets due to their aroma and unique cooking qualities. The traditional tall, low yielding. basmati cultures like Basmati-370 or Type-3 inspite of having high premium in the grain market cannot compete with high yielding varieties in terms of profit per hectare. Therefore, intensified efforts are needed to develop relevant technology to improve high yielding quality rices which would increase the margin of profit to farmers and also contribute to enhance the quantum of exports reflecting sizeable increase in foreign exchange. Currently, it was reported that enhancing the proportion of high density (HD) grain was considered as a promising approach for exploiting higher productivity in rice