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RATOON CROPPING IN RICE FOR BETTER WATER RESOURCE MANAGEMENT IN A RIVER COMMAND AREA IN TAMIL NADU

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ABSTRACT

Two year yield study on ratoon management of rice revealed that in single crop wet land areas of Periyar-Vaigai river command, raising CV.*Bhavani* rice as the main crop and ratooning it after the harvest would be desirable. Application of 125 kg.ha^{-1} nitrogen and impounding 5 cm depth of water one day after the disappearance of ponded water are recommended for higher yield, water use efficiency and net return of the ratoon crop.

KEY WORDS : Plant crop, Ratoon crop, Water resource

Ratooning is one strategy to enhance rice production cost in a shorter period of time and at a lower production cost. It is also a practical tool in exploiting the ability of the plants to regenerate after harvest.

Ratooning ability differs among cultivars. The genetic factor which affects ratoon performance is the inherent tillering ability of the cultivar. Nitrogen is another important input that greatly determines the growth and yield of rice. Water management before and after crop harvest also affects ratooning ability. Against this back-drop, the present investigation was undertaken to choose a suitable ratoon rice for the single crop rice area and to optimise nitrogen and water input.

MATERIALS AND METHODS

Field experiments were laid out at the Agricultural College and Research Institute, Madurai during 1984-'86. In a split plot design, combinations of three cultivars *viz.,Bhavani* (V_1), *Ponni* (V_2), and IR 20 (V_3) and two irrigation levels *viz.*, impounding 5 cm depth of water throughout crop period (T_1) and impounding 5 cm depth one day after disappearance of ponded water (I_2) were allotted to the main plot and four N levels *viz.*, 50 Kg (N_1), 75 kg (N_2), 100 kg (N_3) and 125 (N_4) N ha^{-1} to the sub plot. During 1984-85, *Bhavani*, *Ponni* and IR 20 were transplanted on 15 July 1984. IR 20 plant crop came to harvest on 22 November 1984 whereas *Bhavani* and *Ponni* were harvested on 26 November 1984. In the ratoon crop, *Bhavani* and *Ponni* were harvested earlier on 5 Febuary 1985 and IR 20 on 10 Febuary 1985. During 1985-'86, all the three varieties were transplanted on 1 August 1985. In the plant crop, IR 20 was harvested on 5 December 1985, and *Bhavani* and *Ponni* on 8 December 1985. In the ratoon crop, *Bhavani* and *Ponni* were harvested on 15 Febuary 1985 and IR 20 on 28 Febuary 1985. The quantity of water applied inclusive of rainfall during the growth period of ratoon crop was 855 mm and 595 mm respectively for I_1 and I_2. Irrigation treatment was regulated through Parshall flume.

At harvest, 20 cm long stubbles were left behind to facilitate regrowth. In the ratoon crop, the plots were cleaned and dried leaves, weeds and decaying stubbles were removed. First irrigation was given three days after the harvest of the plant crop. Half the N and full dose of P_2O_5 and K_2O were applied in two equal splits on 27th day and 37th day after harvest which coincided with tillering and panicle initiation stages. The applied fertilisers were incorporated by pressing under the feet.

Table 1. Cultivar, Irrigation and N levels on grain yield of plant on ratoon crop.

Treatment	Plant crop		Ratoon crop		Percentage of ratoon crop over plant crop	
	1984-'85	1985-'86	1984-'85	1985-'86	1984-'85	1985-'86
V_1	2917	5137	1595	2942	54.7	57.3
V_2	2485	5328	1292	1277	38.7	24.0
V_3	3828	5566	324	314	8.5	5.6
SE_d	164	303	33	71	--	--
CD (5%)	900	NS	73	158	--	--
I_1	--	--	1118	1423	--	--
I_2	--	--	1137	1599	--	--
SE_d	--	--	26	58	--	--
CD (5%)	--	--	NS	129	--	--
N_1	--	--	953	1223	--	--
N_2	--	--	969	1280	--	--
N_3	--	--	1041	1667	--	---
N_4	--	--	1145	1905	--	--
SE_d	--	--	28	93	--	--
CD (5%)	--	--	59	188	--	--

NS : Not significant

RESULTS AND DISCUSSION

Marked variation in the yielding ability of grain among the varieties was observed under ratoon cropping during 1984-'85 and 1985-'86. This is due to the inheritance mechanism of ratooning ability of rice varieties which is rather complex and it appears to be liable for variation in the ratoon crop yield. A similar conclusion was observed by Das and Ahmed (1982), and Sunxiaohui *et al.*, (1986) Among the varieties, *Bhavani* recorded significantly higher grain yield followed by *Ponni* and IR 20 in both the years. Higher grain yield of *Bhavani* was contributed by thicker culm, higher carbohydrate content in the stubbles and higher leaf area index. The low yield of *Ponni* and IR 20 was the indicative of poor adaptability for ratooning.

Yield difference due to irrigation levels was not significant during the first year (Table 1). However, impounding of 5 cm depth one day after the disappearance of ponded water (I_2) registered numerically higher yield as compared to impounding of 5 cm depth of water continuously throughtout the crop period (I_1). During second year, irrigation levels significantly influenced the grain yield. Higher grain yield recorded in ratoon rice following when irrigation was given 5cm depth one day after the disappearance of ponded water.

Table 2. Cultivar, irrigations and N levels on water requirement of ratoon crop (cm)

Treatment	1984-'85					1985-'86				
	N_1	N_2	N_3	N_4	Mean	N_1	N_2	N_3	N_4	Mean
V_1	79.6	77.6	79.5	78.1	78.7	71.4	71.5	72.4	71.3	71.65
V_2	79.9	81.4	79.6	77.3	79.6	72.2	71.3	70.1	70.8	71.10
V_3	77.0	80.4	78.5	79.5	78.9	75.4	70.8	72.8	72.3	72.83
I_1	88.2	83.6	93.7	92.6	88.3	85.4	85.3	86.1	85.8	85.65
I_2	60.2	64.6	65.9	64.5	69.0	60.6	57.1	58.8	57.2	58.43
Mean	77.0	77.5	79.4	78.4		73.0	71.2	72.0	71.4	
			SE_d	CD (5%)			SE_d	CD (5%)		
	V		1.5	NS			1.4	NS		
	I		1.2	2.6			1.1	2.5		
	V at I		2.1	NS			1.9	NS		
	N		0.7	NS			1.3	NS		

NS : Not significant

Table 3. Economics of main and ratoon rice for the year 1985-'86

Treatment	Net return (Rs.ha^{-1})	Per day productivity economic produce (kg.ha^{-1})	Net return per rupee invested
Cultivar			
Bhavani	17,234	38.47	2.51
Ponni	12,177	30.25	1.74
IR 20	10,072	27.34	1.45
Irrigation			
Impounding 5 cm depth throughout crop period	13,043	30.34	1.84
Impounding 5 cm depth one day after the disappearance of ponded water	14,090	32.44	2.01
N levels			
50 kg.ha^{-1}	12,791	29.53	1.86
75 kg.ha^{-1}	13,741	30.97	1.94
100 kg.ha^{-1}	14,214	32.78	2.01
125 kg.ha^{-1}	14,694	34.02	2.05

Higher yield was the influence of alternate wetting and drying which provided oxidised condition at the root zone leading to facilitate more uptake of nutrients and more tiller production. The low yield under continuous submergence could be attributed to decaying of basal tillers which lacked oxygen. This result is in accordance with the findings of Bahar and De Datta (1977) who reported more missing hills as the interval between irrigation was shortened leading to rotting of resting buds of ratoon crop. Impounding 5 cm depth one day after the disappearance of ponded water resulted in overall saving of 34 per cent compared to continuous submergence throughout the crop period (Table 2). Besides water economy, higher grain yield was also obtained. Interaction effect of varieties and N levels with water requirement were not marked. At higher N levels of 100 and 125 kg.ha^{-1}, water requirement was almost same. Compared to plant crop requirement of 80 to 100 cm that for the ratoon crop was below 60 cm. The effect of interaction among varieties and irrigation levels did not influence the grain yield in both years.

The grain yield of ratoon crop was significantly influenced by application of N. Higher grain yield was recorded at 125 kg. ha $^{-1}$ N (N_4). The grain yield increased with the increasing level of N though the differences in yield between N_1 (50) and N_2 (75 Kg.ha $^{-1}$ N) was not significant in both the years. The influence of N on grain yield of rice is well documented (Mengel and Wilson, 1981; Chatterjee *et al.*, 1982).

There were striking differences in grain yield between the years in plant and ratoon crops (Table 1). During the first year, the crop yield was lower due yellowing syndrome, which prevailed almost throughtout Tamil Nadu at that time.

IR 20 registered higher grain yield in the plant crop (Table 2). In the ratoon crop, *Bhavani* registered higher grain yield. The percentage of ratoon crop yield obtained with *Bhavani* compared to the plant crop during first and second years were 54.7 and 57.3, respectively. The ratoon crop of *Ponni* registered an yield of 38.8 and 24.0 per cent compared to its plant crop during first and second year, respectively. The ratoon crop of IR 20 registered very low grain yield 8.5 and 5.6 per cent during first and second year, respectively.

Economics of second year rice ratoon crop alone was worked out since the first year yield was affected by yellowing. It revealed that *Bhavani* proved superior recording higher net return, per day production and net return per rupee invested than *Ponni* and IR 20 (Table 3). Impounding 5 cm depth one day after the disappearance of ponded water recorded higher net return, per day production and net return per rupee invested. The relatively lowest economics recorded at continuous impounding of irrigation water to a depth of 5 cm might be due to higher cultivation expenses because of higher cost of irrigation.

Higher grain yeild and net return from *Bhavani* were due to less cost of cultivation and reduced duration. Though *Ponni* and IR 20 registered higher grain yeild in the plant crop, the grain yield obtained from the ratoon crop of both the varieties was very low. Hence net return, per day production and net return per rupee were very low in these varieties. Increased net return per day production and net return per rupee invested were recorded with increasing N levels due to higher ratoon crop grain yield.

It is concluded that in single crop wetland area of Periyar-Vaigai command, allowing *Bhavani* to ratoon after the harvest would be desirable. Application of 125 kg.ha^{-1} N and irrigating the crop to a depth of 5 cm one day after the disappearance of ponded water would result in higher yield, greater water use efficiency and higher net return.

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EFFECT OF ORGANIC AMENDMENTS AND ZINC ON AVAILABILITY AND UPTAKE OF P, Ca AND Na BY SUGARCANE

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ABSTRACT

The efficacy of organic amendments (pressmud and zinc enriched pressmud) and zinc fertilisation was studied in paper factory effluent irrigated soil. The results showed that available phosphorus content in soil and its uptake in plant were increased due to the application of pressmud. Application of amendments and $ZnSO_4$ significantly increased exchangeable calcium, but decreased the exchangeable sodium. Total day matter production was significantly enhanced by the application of pressmud and soil application of $ZnSO_4$. Enrichment of pressmud with $ZnSO_4$ resulted in increased dry matter production. Foliar spray of zinc at 0.5 per centconcentration given at 90 and 110 days after planting significantly increased the dry matter production over soil application of zinc and control.

KEY WORDS : Zinc enriched pressmud -paper factory effluent - irrigated soil - nutrient availability and uptake - total dry matter production.

In recent years due to rapid industrilisation and urbanisation, it is not possible to bring more area under cultivation to step up the agricultural production. The only possible way is to increasee the production per unit area per unit time and to bring the degraded/polluted/ waste lands under cultivation by suitably reclaiming/managing them and using enriched organics. Keeping these points in view, this enrichment of amendment (pressmud) with micronutrient like zinc was designed to support the nutritional needs of plants.

MATERIALS AND METHODS

The field experiment was conducted at the farm of M/s. Ponni Sugars & Chemicals Ltd., Erode, to assess the favourable and adverse implications of effluent irrigation on soil