Research Journal of Agriculture and Biological Sciences, 3(5): 522-524, 2007

Influence of Varieties and Management Practices on Growth, Yield and Economics of Direct Seeded Rainfed Rice in Coastal Saline Soil

M. Mohamed Amanullah, [2]D. Vanathi, [3]S. Natarajan and [4]S. Ramasamy

[1,2,4] Department of Agronomy, [3] Centre for Soil and crop Management Studies
Tamil Nadu Agricultural University, Coimbatore – 641 003, Tamil Nadu, India.

Abstract: A field experiment was conducted in farmers' field at Nagapattinam, Tamil Nadu, in *rabi* 2004 (September, 2004 to January, 2005) to identify the suitable rice variety for direct seeding under rainfed conditions and also to find out a suitable management practice for rainfed direct seeded rice. The experiment was laid out in a split plot design with four replications. The main plot comprised of four varieties viz., CO 43, TRY 1, ADT 36 and Dandi. The subplot consisted of three management practices viz., 1% KCl as seed hardening treatment and spray at active tillering and panicle initiation, azospirillum seed and soil application (600 gm $ha^{-1}$and 2 Kg ha^{-1}, respectively) and control. All plots received a common dose of NPK of 150:50:50 Kg NPK ha^{-1} for CO 43 and TRY 1 and 120:38:38 NPK ha^{-1} for ADT 36 and Dandi. The study revealed that the rice variety CO 43 among the varieties and 1% KCl seed treatment and spray at active tillering and panicle initiation stage among the management practices were found to increase the yield in direct sown rainfed rice in Nagapattiinam district.

Keywords: Rainfed rice – varieties- management practices- KCl spray – azospirillum - yield

INTRODUCTION

Nagapattinam district of Tamil Nadu, India is one of the major rice growing districts of the state having 9.1 % of the rice area of the state. Rice is cultivated both under irrigated lowland and direct seeded rainfed conditions and 10 % of the rice out of 1.37 lakh ha in the district is cultivated under rainfed conditions. Direct seeding of rainfed rice is commonly followed in these areas. Sowing of rainfed rice coincides with the onset of the monsoon and irregular pattern and erratic distribution of rainfall are the regular features of the district. Due to early dry spells, a crop has to be sown nearly twice or thrice for crop establishment. Moisture stress during the middle of the season i.e. 50 to 70 DAS reduces the yield in rainfed rice. Early withdrawal also affects the crop. The yield of rainfed rice is thus low and variable depending on the vagaries of monsoon. Selection of varieties tolerant to drought and adoption of suitable management practices that aids in better crop growth and yield are conducive in increasing the productivity under rainfed conditions. Seed hardening could a better option, as it is simple and economical. Singh and Chatterjee[4] found that seed hardening increased yield attributes such as productive tillers and number of grains per panicle. Manjappa[1] found that the combined application of *Azospirillum* and nitrogen had a significant effect on grain and straw yield. Hence with these ideas in view, the present investigation was carried out to identify the suitable rice variety for direct seeding under rainfed conditions and also to find out a suitable management practice for getting higher yield in rainfed direct seeded rice.

MATERIALS AND METHODS

A field experiment was conducted in farmers' field at Nagapattinam, Tamil Nadu, in *rabi* 2004 (September, 2004 to January, 2005) in a Typic Ustifluvents soil of Sethi series. The soil was sandy clay loam in texture. The soil had 119 kg $ha^{-1}$of N (low), 16.5 kg ha^{-1} of P_2O_5 (medium) and 272.4 kg ha^{-1} of K_2O (medium). The pH, EC and organic carbon of the soil were 7.8, 4.06 dSm^{-1} and 0.28 % respectively. The rainfall received during the cropping period was 1157mm in 37 rainy days.

The experiment was laid out in a split plot design with four replications. The main plot comprised of four varieties viz., CO 43, TRY 1, ADT 36 and Dandi. The subplot consisted of three management practices viz., 1% KCl as seed hardening treatment and spray at active tillering and panicle initiation, azospirillum seed and soil application (600 gm $ha^{-1}$and 2 Kg ha^{-1}, respectively) and control. All plots received a common dose of NPK of 150:50:50 Kg NPK ha^{-1} for CO 43 and TRY 1 and 120:38:38 NPK ha^{-1} for ADT 36 and

Corresponding Author: Dr. M. Mohamed Amanullah, Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore – 641 003. E-mail: aman_agron@yahoo.co.in

Table 1: Effect of varieties and management practices on growth parameters and yield attributes of rainfed rice

Treatments	Growth parameters				Yield attributes		
	Plant height (cm)	LAI	Productive tillers m^{-2}	DMP at harvest (t ha^{-1})	Panicle length (cm)	Number of grains $panicle^{-1}$	Filled grains $panicle^{-1}$
Varieties							
V_1 - Co 43	91.7	4.43	220	7.18	18.40	105	85.1
V_2 - TRY 1	90.4	4.29	208	6.92	17.7	98.5	80.5
V_3 - ADT 36	70.0	3.91	188	5.73	15.7	81.5	67.5
V_4 - Dandi	76.5	4.12	206	6.17	16.9	84.3	73.6
SEd	2.48	0.10	2.7	0.18	0.22	2.58	1.64
CD (p=0.05)	5.12	0.20	5.7	0.36	0.46	5.4	3.4
Management practices							
T_1 - 1 % KCl	87.7	4.49	236	7.33	20.0	99.1	82.4
T_2 - Azospirillum	84.8	4.29	220	6.64	17.7	91.8	75.7
T_3 - Control	73.9	3.79	161	5.53	13.8	86.3	71.9
SEd	2.14	0.08	2.38	0.16	0.20	2.24	1.42
CD (p=0.05)	4.44	0.18	5.0	0.34	0.44	4.62	2.94

Table 2: Effect of varieties and management practices on nutrient uptake, yield and economics of rainfed rice

Treatments	Nutrient uptake (Kg ha^{-1})			Yield (t ha^{-1})		Economics	
	N	P	K	Grain	Straw	Net return (Rs ha^{-1})	B:C ratio
Varieties							
V_1 - Co 43	56.3	14.1	63.1	3.35	4.19	7614	1.54
V_2 - TRY 1	53.8	13.8	66.3	3.11	4.07	6178	1.43
V_3 - ADT 36	51.9	12.3	66.8	2.57	3.43	4175	1.33
V_4 - Dandi	50.4	11.4	64.4	2.77	3.76	5806	1.52
SEd	0.7	0.4	0.9	0.12	0.12	-	-
CD (p=0.05)	1.5	0.9	1.9	0.26	0.26	-	-
Management practices							
T_1 - 1 % KCl	55.4	14.7	68.5	3.35	4.30	8154	1.61
T_2 - Azospirillum	53.8	13.3	66.8	3.04	3.90	6292	1.48
T_3 - Control	50.1	10.7	60.1	2.45	3.39	3384	1.28
SEd	0.6	0.4	0.8	0.12	0.12	-	-
CD (p=0.05)	1.3	0.8	1.6	0.24	0.24	-	-

Dandi. The entire P was applied as basal dose. The N as urea and K as muriate of potash were applied in four equal split doses at seedling, active tillering, panicle initiation and flowering stages. The paddy seeds were soaked in water for 12 hours and incubated for 24 hours. The sprouted seeds were sown in leveled field. The data on growth parameters and yield components were recorded at flowering and maturity stages. Grain yield was recorded and reported at 14 % moisture content.

RESULTS AND DISCUSSIONS

Effect of Varieties: Among the varieties tested, taller plants, higher LAI, more number of tillers and higher dry matter production were recorded in the variety CO 43. This was followed by TRY 1 and Dandi. Yield attributes like panicle length, panicle number and filled grains were also higher in the variety CO 43 than that in other varieties. Similar trend was observed in grain and straw yield also. Regarding the nutrient uptake, the

variety CO 43 had the highest uptake of N and P, whereas TRY 1 had the highest uptake of K. Cumulative effect of all these resulted in the highest B:C ratio of 1.54 in the variety CO 43 (Table 1). However the variety Dandi also recorded comparable B:C ratio of 1.52 indicating the suitability for direct seeding under rainfed conditions.

Effect of Management Practices: The expression of growth and yield attributes was considerably higher in treatments involving management practices than control. Among the management practices, 1% KCl as seed hardening treatment and spray at active tillering and panicle initiation recorded taller plants, higher LAI, more number of tillers and higher drymatter production. This was followed by application of Azospirillum. The positive effect of KCl treatment might be due to the quick germination, early vigour and early root development. The increase in root growth might have promoted better crop growth through better utilization of moisture and nutrients. Potassium chloride 1 % as seed hardening treatment and spray at active tillering and panicle initiation also recorded better yield attributes and uptake of all the nutrients than the other treatments. Similar trend was observed in grain and straw yield also. Cumulative effect of all these resulted in the highest B:C ratio of 1.60 with KCl treatment.

The increase in yield might be due to better root development, enhanced growth and yield parameters due to seed treatment and also better utilization of moisture and nutrients by rainfed crop. These additive effects consequently led to better utilization of available and applied nutrients. Ramadass[2] found that the treatment with KCl enhanced the growth parameters and ultimately the yield and yield attributes of rainfed rice. Similar findings were reported by Saxena and Pandey[3] who observed that seed treatment with one per cent potassium salts increased the yield components and yield of rice.

Conclusion: The study revealed that the rice variety CO 43 among the varieties and 1% KCl seed treatment and spray at active tillering and panicle initiation stage among the management practices were found to increase the yield in direct sown rainfed rice in Nagapattiinam district.

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