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Agronomic response of aerobic rice to sowing dates and varieties / hybrids

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Abstract

A field experiment was conducted during *kharif* 2012 to find out optimum date of sowing and variety / hybrids for aerobic rice. Earlier (6th July) sowing significantly recorded higher panicles / m², panicle weight and grain yield over other two dates (19th and 30th July) of sowing. The variety MTU 1010 performed well across the dates of sowing and identified as most suitable variety for aerobic cultivation. KRH 2 was the most suitable hybrid for delayed sowing (19th July) recording similar grain yield as first date (6th July) of sowing. The monetary returns were also higher with first date of sowing and among varieties higher with MTU 1010 in aerobic rice.

Keywords: Aerobic rice, dates of sowing, varieties, hybrids

Introduction

Rice is the most important cereal crop cultivated in the world. One fifth of the world's population – more than a billion people depend on rice cultivation for their livelihoods. Asia, where about 90% of rice is grown, has more than 200 million rice farms, most of which are smaller than 1 hectare. To keep rice prices stable and affordable at around \$ US 300 a ton, IRRI estimates that an additional 8-10 million tons of rice needs to be produced every year (http://www/irri.org/rice_basics) [3]. The challenge, above anything else is to produce this additional rice with less land, less water and less labour in more efficient, environmentally friendly production systems that are more resistant to climate change. Aerobic rice is one such option.

Aerobic rice is a production system in which especially developed 'aerobic rice' varieties are grown in well-drained, non puddle and non-saturated soil with appropriate management, the system aims for yields of at least 4-6 tons per hectare (http://www/irri.org/aerobic_rice) [4]. As the definition implies evaluation of suitable varieties for aerobic rice is prime requisite before advocating the farmers. Since, the concept of aerobic rice is new, evaluation of these different varieties / hybrids under different dates of sowing is necessary for compressive picture of the aerobic cultivation. Therefore considering the importance and usefulness of this studies were undertaken for the present investigation.

Materials and methods

A field experiment was conducted at Rice Research Centre, Agricultural Research Institute, Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad, Telangana (17°19'N, 78°23'E, 542m above sea level) during the rainy season of 2012. The climate is subtropical with a hot summer, wet monsoon season (June – September) and a cool dry winter. Average annual rain fall is 795mm, 85% of which falls during the monsoon season. The soil of the experimental site was sandy clay loamy with a pH of 7.48 having 151, 107 and 871 kg N, P₂O₅ and K₂O kg/ha, respectively. The site was under rice – fallow cropping system for 3 years before the establishment of the experiment. The rainfall, sunshine hours, and maximum and minimum temperature were measured at Agrometeorological Observatory, Agro Climate Research Centre (About 800m away from the experimental site) and presented in Table 1.

Table 1: Weather data during crop growth period

Parameters	July	August	September	October	November	December
No. of rainy days	11.0	9.0	10.0	5.0	2.0	0.0
Rainfall (mm)	261.6	99.4	117.9	58.9	47.0	0.0
Mean Maximum temperature (°C)	30.2	30.2	30.1	30.3	28.7	30.2
Mean Minimum temperature (°C)	23.1	22.5	22.2	18.5	15.9	13.1
Mean Sunshine hours (No./ day)	10.3	5.2	5.0	6.7	6.5	9.0

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Field was prepared with two passes using cultivator, followed by rotavator. Rice seeds were sown as and when good showers were received with an interval of 10-12 days using the selected varieties / hybrids. Seed were sown manually at a seed rate of 30 kg ha⁻¹ at 20cm row spacing and 10cm plant spacing. The recommended fertilizer dose 120:60:40kg N, P₂O₅ and K₂O/ha was applied. Full dose of phosphorus, half the dose of potash and one third of nitrogen was applied basally. Remaining nitrogen was applied in two equal splits at tillering and panicle initiation stage. Half the dose of Potash was also applied with the last dose of nitrogen. The

experimental field was sprayed twice with 1% ferrous sulphate solution at 20 and 40 days after sowing.

The experiment was laid out with three replications in a split plot design with a plot size of 6 x 3.4m. The experiment had 18 treatments with a combination of three dates of sowing (July 6, July 19 and July 30) and six entries (RNR 1446, MTU 1010, MTU 1001, RNR 2458, KRH 2 and DRRH3). The details of the entries are given in Table 2. The field was kept moist but not flooded throughout the cropping season by irrigating as and when necessary.

Table 2: Details of the varieties / hybrids grown

Variety / hybrid	Duration (Days)	Actual days taken for harvesting	Remarks
RNR 1446 (Satya)	115-120	108	Early duration, long slender grain variety
MTU 1010 (Cotton dora sannalu)	125	117	Early duration, long slender grain, BPH tolerant, highly adoptable variety
MTU 1001 (Vijetha)	130-135	128	Medium duration, bold grain, BPH, blast tolerant variety
RNR 2458 (Krishna)	130-135	128	Medium duration, fine grain blast resistance variety
KRH 2	130-135	127	Medium duration, long slender grain variety
DRRH 3	130-135	129	Medium duration, long slender grain variety.

Results and Discussion

Dates of sowing and varieties / hybrids had significant influence on certain yield attributes and grain yield of aerobic rice.

Earlier sowing (6th July) significantly recorded higher panicle number (573/m²) over other two dates of sowing (19th July – 520/m², 30th July – 396/m²). Panicle weight was also maximum (2.76g) with first date of sowing (6th July) and the decrease in weight was 5.8 and 10.5 percent with 13 and 24 days delay over first sowing (Table 3 & 4). The earlier sown crop benefitted by the better environment (solar radiation, temperature) is the prime reason for higher yields and this is in agreement with the finding of Sreenivas (2005) [5] in Semi – dry rice.

Of the different varieties / hybrids tested, highest panicle number (534/m²) was recorded in KRH-2 hybrid which was at par with DRRH-3 hybrid (509 / m²) and significantly superior over other varieties. On the other hand, maximum panicle weight (3.55g) was recorded with DRRH3 hybrid which was significantly superior over KRH2 hybrid and other varieties. Lowest 1000 grain weight (13.82g) was recorded with RNR 2458 indicating the fineness of the variety.

Grain yield was significantly influenced by dates of sowing, varieties and interaction effects. Sowing of aerobic rice on 6th July recorded grain yield of 4378 kg/ha which was significantly superior over other two dates of sowing. Of the

different varieties / hybrids evaluated under aerobic condition, MTU 1010 recorded mean grain yield of 4255 kg/ha, which was on par with MTU 1001(4180 kg/ha), KRH 2 (4128 kg/ha) and DRRH 3 (4100 kg/ha) and significantly superior over RNR 1446 (3665 kg/ha) and RNR 2458 (3194 kg/ha). Grain yield of variety / hybrid depends on its genetic potential. Research experiments conducted in different locations by investigators proved importance of location specific varieties / hybrids for different rice cultivation systems (Babu and Reddy, 2000 [2]; Amanda and Reddy, 2002 [1]). In the present study, MTU 1010 proved to be best variety for aerobic cultivation.

The interaction between dates of sowing and varieties were significant. All the varieties / hybrids except for KRH 2, significantly recorded lower grain yields in second sowing (19th July) over first sowing (6th July). KRH 2 recorded grain yield of 4395 and 4390 kg/ha is first and second sowings respectively, indicating plasticity of the hybrid.

Aerobic rice sown on 6th July recorded higher gross returns (Rs.59103 / ha), Net returns (Rs.22653/ ha) and B: C ratio (1.62) as compared to the other two dates of sowing. Among the varieties, higher gross returns (Rs. 57443/ ha), Net returns (Rs.20864/ ha) and B: C ratio (1.57) were recorded with MTU1010 followed by MTU 1001, KRH 2 and DRRH 3 hybrids (Table 3).

Table 3: Yield attributes and economics as influenced by different dates of sowing and varieties in aerobic rice

Treatment	Panicle / m ² (Number)	1000 grain wt (g)	Cost of cultivation (Rs/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	Benefit: Cost Ratio
Dates of Sowing						
D1 - 6 th July	573	20.14	36450	59103	22653	1.62
D2 - 19 th July	520	19.81	37315	54527	17211	1.46
D3 - 30 th July	396	19.57	38223	45144	6921	1.18
SE d+	9.58	0.23	-	-	-	-
C.D. (p=0.05)	27	NS	-	-	-	-
Varieties / Hybrids						
V1 - RNR 1446	490	21.45	36485	49478	12993	1.36
V2 - MTU 1010	496	22.78	36578	57443	20864	1.57
V3 - MTU 1001	484	21.48	37342	56430	19088	1.51
V4 - RNR2458	465	13.82	37539	43119	5580	1.15
V5 - KRH2	534	21.37	38042	55728	17685	1.46
V6 - DRRH3	509	18.10	37988	55350	17362	1.46
SE d+	15.79	0.41	-	-	-	-

C.D.(p=1.05)	32	0.84	-	-	-	-
Interaction						
V x D						
SE d+	27.36	0.71	-	-	-	-
C.D. (p=0.05)	NS	NS	-	-	-	-
D x V						
SE d+	26.75	0.70	-	-	-	-
C.D. (p=0.05)	NS	NS	-	-	-	-

Table 4: Panicle weight (g) and grain yield (kg/ha) as influenced by different dates of sowing and varieties in aerobic rice

Varieties / Hybrids and Dates of sowing	Panicle weight (g)				Grain yield (kg/ha)			
	D1 (6 th July)	D2 (19 th July)	D3 (30 th July)	Mean for varieties / hybrids	D1 (6 th July)	D2 (19 th July)	D3 (30 th July)	Mean for varieties / hybrids
V1- RNR 1446	2.25	2.18	2.10	2.18	4126	3764	3106	3665
V2 – MTU 1010	2.56	2.40	2.19	2.38	5058	4372	3336	4225
V3 – MTU 1001	2.74	2.33	2.27	2.45	4656	4280	3602	4180
V4 – RNR 2458	2.05	2.07	2.01	2.04	3446	3284	2852	3194
V5 KRH 2	3.21	3.00	3.01	3.07	4395	4390	3599	4128
V6 – DRRH 3	3.74	3.64	3.27	3.55	4589	4142	3568	4100
Mean for dates of sowing	2.76	2.60	2.47		4378	4039	3344	
	SE d+	C.D. (p=0.05)			SE d+	C.D. (p=0.05)		
Dates of sowing	0.06	0.17			19.60	58		
Varieties / Hybrids	0.04	0.07			78.43	165		
V x D	0.06	0.13			137.25	285		
D x V	0.08	0.20			129.13	266		

Conclusion

The aerobic rice responded well to first date of sowing (6th July) resulting in increased panicles / m², panicle weight, grain yield of the crop. Of the varieties / hybrids tested MTU 1010 was promising across the dates of sowing and proved as most suitable variety for aerobic cultivation. In Southern Telangana Zone of Telangana, earlier sowing with MTU 1010 variety recommended for higher yields under aerobic cultivation.

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