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RESEARCH ARTICLE :

Evaluation of rice (*Oryza sativa* L.) hybrids for system of rice intensification (SRI) with limited water input

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SUMMARY : A number of hybrids had been released to enhance the productivity of rice. There is a need to increase the rice productivity to sustain global food security with low inputs. In this context, experiment was conducted to evaluate the hybrid rice cultivars for best suitability for system of rice intensification (SRI) method of cultivation in comparison with normal transplanting method with limited water inputs. Yield parameters like panicle number, panicle length, panicle weight were found significant over methods, irrigation and cultivars. Grain yield, straw yield and days for 50% flowering were significant over methods. The per cent of water saved in AWD over saturation was 33%. System of rice intensification method recorded 17.2% higher grain yield over normal transplanting method. Grain yield was on par in both irrigation regimes. As a result, it was observed that system of rice intensification method with alternate wetting and drying irrigation can be adopted for hybrid rice cultivation for those areas with less irrigation facilities.

KEY WORDS :
SRI, NTP, Saturation, AWD

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BACKGROUND AND OBJECTIVES

Traditional planting is the most conventional and common method of rice establishment under irrigated low land ecosystems in India. Irrigated low land rice not only consumes more water but also causes wastage of water. In recent years to address this problem, many methods of rice cultivation were developed and System of Rice Intensification (SRI) is one among them and it reduces the water application without compromising the rice yield (Shanthappa *et al*., 2016). There is ample scope to increase productivity of rice by manipulating the plant environmental conditions that could modify microclimate and soil conditions. SRI method of cultivation works by integrating processes such as reduced plant population, careful transplanting single young seedling, wider and square planting, mechanical weeding with need based fertilizer application and optimum use of water for better growth especially soil aeration (Kumar and Shivay, 2004). Non availability of laboures for transplanting at appropriate time leads to late planting resulting in poor yield (Awan *et al*., 2008). In India, the area under rice crop has been decreasing over the years due to various factors such as urbanization, migration of labour from agriculture to non agriculture sector, increased input and labour costs are seriously threatening the cultivation of rice (Yadav *et al*., 2013). A number of hybrids had been released to enhance the productivity of rice. There is a need to increase the rice productivity to sustain global food security with low inputs. In this context, experiment was conducted to evaluate the hybrid rice cultivars for best suitability for system of rice intensification (SRI) method of cultivation in comparison with normal transplanting method with limited water inputs.

RESOURCES AND METHODS

Field experiment was conducted with four promising hybrid cultivars *viz.*, KRH2, US 312, PA 6444 and DRRH3 at Indian Institute of Rice Research farm in ICRISAT in *Kharif* 2015 season in sandy clay loam soil for assessing the performance of hybrids for system of rice intensification (SRI) method over normal transplanting method with reduced seed rate and limited water input (Saturation and Alternate wetting and drying-AWD). The total water applied was 800mm for SRI and 1200mm for NTP.

OBSERVATIONS AND ANALYSIS

Crop establishment techniques in two irrigation and

Table 1 : Yield attributes as influenced by crop establishmenthods, irrigation and hybrid cultivars and computed F values from analysis of variance (ANOVA) of major parameters in this study

Establishment method	Irrigation	Hybrid cultivars	Plant height (cm)	No. of tillers/M_2	No. of panicles/ M_2	Panicle length (cm)	Panicle Wt (g)	Test Wt (g)	Days for 50% flowering	Grain yield t/ha	Straw yield t/ha	Harvest index
SRI	Saturation	KRH2	84.3	366	338	24.4	50.6	2.1	91.3	6.38	6.91	48.0
		US-312	89.6	430	363	27.0	53.3	2.0	91.0	6.32	6.84	48.0
		PA 6444	92.9	341	318	24.7	51.1	2.2	105.3	6.32	6.82	48.1
		DRR H3	95.5	430	417	24.0	65.7	1.6	99.3	6.10	6.50	48.4
	AWD	KRH2	92.0	468	414	25.3	47.8	2.2	91.3	6.41	6.97	47.9
		US-312	91.3	405	359	27.1	57.1	2.0	90.7	6.16	6.51	48.6
		PA 6444	89.8	351	319	24.4	54.1	2.2	104.0	6.06	6.56	48.0
		DRR H3	91.6	471	427	23.8	57.3	1.7	100.3	5.91	6.41	48.0
NTP	Saturation	KRH2	98.7	222	206	23.6	40.2	2.3	97.7	5.72	6.17	48.1
		US-312	93.0	320	281	26.7	42.5	2.0	100.0	5.36	5.97	47.3
		PA 6444	88.6	201	184	23.3	46.2	2.4	110.7	5.12	5.58	47.8
		DRR H3	102.6	218	202	22.1	49.2	1.7	106.3	5.13	5.51	48.2
	AWD	KRH2	94.4	234	218	25.3	46.0	2.2	99.0	5.29	5.81	47.7
		US-312	83.4	256	244	27.2	48.5	2.0	98.7	5.40	5.81	48.2
		PA 6444	78.8	236	223	24.6	49.7	2.3	111.7	5.15	5.57	48.0
		DRR H3	95.3	289	268	23.4	51.6	1.7	106.7	5.25	5.74	47.7
M1			90.9	407.9	369.3	25.1	54.6	2.0	96.7	6.21	6.69	48.1
M2			91.9	247.0	228.2	24.5	46.7	2.1	103.8	5.30	5.77	47.9
Saturation			93.2	316	289	24.5	49.8	2.0	100.2	5.81	6.29	48.0
AWD			89.6	339	309	25.1	51.5	2.0	100.3	5.70	6.17	48.0
Treatments	KRH2		92.4	323	294	24.6	46.1	2.2	94.8	5.95	6.46	47.9
	US-312		89.3	353	312	27.0	50.3	2.0	95.1	5.81	6.28	48.0
	PA 6444		87.5	282	261	24.2	50.2	2.3	107.9	5.66	6.13	48.0
	DRR H3		96.3	352	328	23.3	55.9	1.7	103.2	5.59	6.04	48.1
Method (M)			6.72*	2217.61**	1902.54**	6.13*	148.11**	16.11**	1324.66**	68.41**	68.8**	5.29*
Irrigation (I)			94.85**	44.29**	39.24**	7.89**	6.52*	0.4ns	0.18ns	0.88ns	1.06ns	0.04ns
I x M			130.16**	7.08*	0.01ns	5.63*	18.1**	4.33*	1.61ns	0.16ns	0.15ns	0.07ns
Treatment (T)			107.75**	95.25**	79.71**	44.76**	38.32ns	255.42ns	1060.18**	2.1ns	2.78ns	0.32ns
T x M			97.48**	29.73**	40.87**	0.82ns	5.42**	1.79ns	5.37**	0.22ns	0.43ns	1.25ns
T x I			25.05**	48.81**	20.04**	0.96ns	6.73**	0.1ns	3.4*	0.11ns	0.35ns	6.04ns
T x I x M			7.38**	17.49**	19.76**	0.42ns	3.54*	0.37ns	4.12*	0.7ns	0.59ns	0.45ns

* and ** indicate significance of values at P=0.05 and 0.01, respectively NS=Non-significant

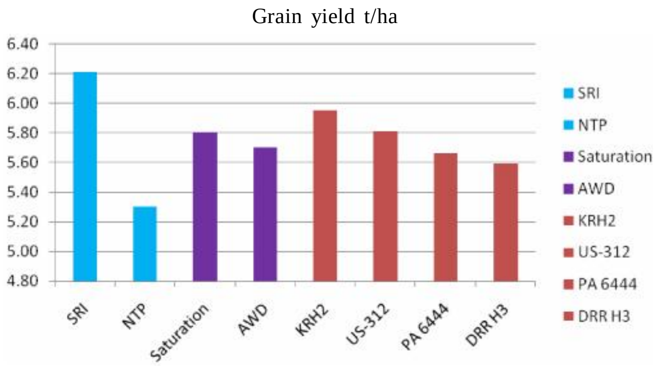

Fig. 1 : Grain yield trend over cultivation methods, irrigation regimes and cultivars

cultivars differed significantly. System of rice intensification resulted in significantly higher grain (6.21 t/ha) and straw (6.69/ha) yield over NTP (5.30 and 5.77 t/ha), respectively (Fig. 1 and Table 1). SRI method with wider spacing and less competition, careful transplanting which enabled the plants to grow vigorously. It helped to capture the essential nutrient elements important for plant growth and development leads to higher tillering and dry matter production (Mohanty *et al*., 2014). Increase in grain yield can also be attributed to favourable effect in accelerating the growth and yield parameters (Alam *et al*., 2013). Irrigation maintained at saturation level throughout the crop growth period produced higher grain (6.81 t/ha) and straw yields (6.29 t/ha), which was on par with AWD. The increase in rice productivity under saturation might be due to favorable vegetative growth and development achieved underadequate and sufficient soil moisture throughout the growth period. Over the hybrid cultivars KRH2 recorded higher grain and straw yield (5.95 and 6.46 t/ha) and was on par with US-312 (5.81 and 6.28 t/ha). Yield parameters like panicle number, panicle length, panicle weight were found significant over methods, irrigation and cultivars. Grain yield, straw yield and days for 50% flowering were significant over methods. As a result, it was observed that system of rice intensification method with alternate wetting and drying irrigation can be adopted for hybrid rice cultivation for those areas with less irrigation facilities and hybrid rice cultivars *viz*., KRH2 and US-312 may be best suitable for SRI method of cultivation. (Fig. 1 and Table 1).

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