

Effect of cultivars and seed rates on weed dynamics and grain yield of rice under wet seeded condition

S.P. Singh* and B. Sreedevi

Directorate of Rice Research, Rajendranagar, Hyderabad, Andhra Pradesh-500030, India

ABSTRACT

Field trials were conducted during wet season 2000 and dry season 2001 to study the effect of cultivars and seed rates on grain yield in wet seeded rice. Among the varieties, mean maximum grain yield was recorded in IET 8887 (2.34 t ha⁻¹) followed by IET 9219 (2.29 t ha⁻¹), IET 8886 (2.26 t ha⁻¹), Rasi (2.24 t ha⁻¹), Vikas (2.22 t ha⁻¹) and IET 9994 (2.19 t ha⁻¹) while the lowest grain yield was recorded in IET 9818 (1.84 t ha⁻¹). Seed rates increased grain yield significantly up to 250 kg ha⁻¹ (2.61 t ha⁻¹) further increase in seed rate did not increase grain yield proportionately. Weed dry matter production reduced significantly up to 300 kg seed ha⁻¹ (57.41 g). Significantly maximum weed dry matter was recorded in c.v. IET 9818. IET 8887 and IET 9994 recorded higher net returns of Rs. 810 ha⁻¹ and Rs.610 ha⁻¹ respectively, Among different seed rates, mean maximum net returns of Rs. 1640 ha⁻¹ was recorded by the seed rate of 250 kg ha⁻¹.

Key words: Varieties, seed rates, weed dry matter, puddled condition, direct seeded

Indiscriminate use of agro-chemicals in rice cultivation is causing threats to environment. Instead of chemical methods of weed control, agronomic practices along with varietal choice appears to manage weed infestation without causing environmental pollution. Modern high yielding varieties with their up right canopy encouraged weed growth compared to many traditional ones with their broad and droopy leaf architecture. Mechanical or manual weeding is difficult due to scarcity of labourers. Chemical weeding although cheaper, but its efficiency is substantially reduced due to heavy rains and also due to their narrow spectrum of weed control. The selection of variety having weed suppressing ability is important to reduce the cost of weeding *vis-a-vis* dependence on herbicides. Required informations on effect of varieties and seed rates for determining the weed dynamics and their subsequent suppression, and grain yield in wet seeded rice are scanty. Standardization of these practices can improve productivity without dependence on herbicides for sustained rice production in vertisols of Andhra Pradesh.

MATERIAL AND METHODS

Field trials were conducted during wet season 2000 and dry season 2001 at the research farm of the

Directorate of Rice Research, Hyderabad. The experimental site was clay (vertisols) having pH of 8.2 with medium in soil available nitrogen (222 kg ha⁻¹) and phosphorus (18.7 kg ha⁻¹), and high in potash (350 kg ha⁻¹). Four seed rates (150, 200, 250 and 300 kg ha⁻¹) of 20 cultures (Rasi, Triguna, Krishnahamsa, Tulsi, Vikas, IR-64, Tellahamsa, IET 9818, IET 8883, IET 8886, IET 8887, IET 9696, IET 9979, IET 9815, IET 13659, IET 10890, IET 11689, IET 11171, IET 12512 and IET 9994) were compared in split plot design with three replications. Seed rates were kept in main plots while cultures were kept in sub-plots. A uniform dose of fertilizer was applied at the rate of 100:60:40 kg ha⁻¹ nitrogen, phosphorus and potash, respectively. Nitrogen was applied in 3 equal splits at sowing, tillering and panicle initiation stage while total quantity of phosphorus and 75% potash was applied at basal and remaining 25% potash was applied at panicle initiation stage.

Sprouted seeds were broadcasted on well puddled and leveled field. A thin layer of water was maintained in the field at the time of sowing of seeds up to 15 days of sowing after that again water level was raised to 5±2 cm. Sowing was done on 15th July and 20th January during wet season 2000 and dry season

2001, respectively. Weeds were not removed in all the treatments. Weeds dry weight was recorded at flowering stage of rice crop. Grain yield and yield attributes (panicle number and panicle weight) were recorded at harvest and final grain yield was recorded at 14% moisture. The selling price of paddy was of Rs. 4,000 ton⁻¹ and cost of cultivation was worked out to be Rs. 7,800 ha⁻¹, Rs. 8,300 ha⁻¹, Rs. 8,800 ha⁻¹ and Rs. 9,300 ha⁻¹ under seed rate of 150, 200, 250 and 300 kg ha⁻¹, respectively.

RESULTS AND DISCUSSION

Effect of seed rates. Yield attribute (panicle number

and panicle weight) differed significantly among different seed rates during both the years. Mean maximum panicle number (257 m⁻²) and panicle weight (2.24 g) were recorded under 250 kg seed ha⁻¹. Grain yield differences among seed rates were significant during both the seasons (Table 1). Grain yield increased significantly up to 250 kg ha⁻¹ seed rate (average of two seasons 2.61 t ha⁻¹). The grain yield was at par between 250 and 300 kg ha⁻¹, but these were significantly higher than that obtained in 150 kg ha⁻¹ (1.05 t ha⁻¹) and 200 kg ha⁻¹ (2.04 t ha⁻¹).

The major weeds in the experimental plots during this investigation were *Echinochloa crus galli*,

Table 1. Effect of cultivars and seed rates on yield attributes and grain yield of rice under wet seeded condition

Treatments	Panicle No. m ⁻²			Panicle weight (g)			Grain yield (t ha ⁻¹)		
	Wet 2000	Dry 2000-2001	Mean	Wet 2000	Dry 2000-2001	Mean	Wet 2000	Dry 2000-2001	Mean
Seed rates (kg ha⁻¹)									
150	152	160	156	1.40	1.35	1.38	1.00	1.09	1.05
200	184	190	187	1.80	1.85	1.83	1.95	2.12	2.04
250	253	260	257	2.23	2.25	2.24	2.47	2.75	2.61
300	263	269	266	2.29	2.30	2.29	2.53	2.84	2.69
CD (P=0.05)	11	15	-	0.08	0.06	-	0.15	0.21	-
Cultivars									
Rasi	233	240	235	2.14	2.11	2.13	2.08	2.40	2.24
Triguna	202	220	211	1.79	1.85	1.82	1.90	2.32	2.11
Krishna Hamsa	216	219	218	1.97	2.00	1.99	1.96	2.32	2.14
Vikas	235	230	233	2.12	2.10	2.14	2.02	2.41	2.22
Tulsi	211	218	215	1.90	2.15	2.04	1.98	2.33	2.16
IR-64	215	221	218	1.97	2.10	2.04	1.94	2.34	2.14
Tellahamsa	228	235	232	2.07	2.10	2.12	1.94	2.28	2.11
IET 9818	216	225	221	1.97	1.85	1.91	1.71	1.97	1.84
IET 8883	205	230	218	1.97	2.05	2.01	2.01	2.24	2.13
IET 8886	232	230	231	2.15	2.19	2.17	2.08	2.43	2.26
IET 8887	231	238	235	2.18	2.15	2.17	2.20	2.48	2.34
IET 9691	204	220	212	2.05	1.95	2.12	2.01	2.29	2.15
IET 9979	228	230	229	1.94	2.10	2.02	2.04	2.33	2.19
IET 9815	202	215	209	1.90	2.10	2.03	1.90	2.77	2.09
IET 13659	211	225	218	1.88	2.00	1.94	1.85	2.18	2.02
IET 10890	218	222	220	1.91	1.95	1.93	2.06	2.16	2.11
IET 11689	196	230	213	1.94	2.00	1.97	1.99	2.29	2.14
IET 11771	198	215	206	1.88	2.02	1.95	2.01	2.19	2.10
IET 12512	197	200	199	1.97	2.00	1.97	2.00	2.29	2.15
IET 9994	235	230	232	2.09	2.15	2.12	2.16	2.42	2.29
CD (P=0.05)	10	16	-	0.12	0.10	-	0.18	0.13	-

Cyperus iria, *Cyperus difformis* and *Marsilia quadrifolia*. Weed dry weights differed significantly during both the seasons (Table 2). Weed dry weight decreased linearly up to 300 kg seed ha⁻¹ (57.41 g m⁻²). The difference among seed rates was significant. The reasons of higher grain yield production at 250 kg ha⁻¹ might be due to higher panicle number (257 m⁻²) and panicle weight (2.23 g) and also smothering of weeds more effectively.

Effect of varieties. Panicle number m⁻² and panicle weight (g) differed significantly during both the seasons. The mean maximum panicle number (235 m⁻²) and panicle weight (2.17 g) were recorded in IET 8887

followed by Rasi, Vikas, IET 8886 and IET 9994. Among varieties grain yield differed significantly during both the seasons (Table 1). IET 8887 produced maximum grain yield (Mean 2.34 t ha⁻¹) closely followed by IET-9994 (2.29 t ha⁻¹), IET 8886 (2.26 t ha⁻¹), Rasi (2.24 t ha⁻¹), Vikas (2.22 t ha⁻¹) and IET-9997 (2.19 t ha⁻¹). IET 8887 was significantly superior to rest of the varieties. Lowest grain yield was recorded in IET 9818 (1.84 t ha⁻¹). Similar grain yield differences were also reported by Singh and Pillai (1996) and Gogai *et al.*, (2000).

Weed dry matter was influenced significantly during both the seasons (Table 2). The mean minimum

Table 2. Effect of cultivars and seed rates on weed dry matter production and economics of rice under wet seeded condition

Treatments	Weed dry weight (g m ⁻²)			Economic returns (Rs. ha ⁻¹)		
	Wet 2000	Dry 2000-2001	Mean	Cost of cultivation (Rs.ha ⁻¹)	Gross income (Rs.ha ⁻¹)	Net returns (Rs.ha ⁻¹)
Seed rates (kg ha⁻¹)						
150	165.10	144.25	154.68	7800	4200	-3600
200	130.03	121.73	125.88	8300	8160	-140
250	94.80	91.95	93.38	8800	10440	1640
300	57.50	57.32	57.41	9300	10760	1460
CD (P = 0.05)	9.44	11.95	-	-	-	-
Cultivars						
Rasi	107.50	97.50	102.50	8550	8960	410
Triguna	110.63	105.00	107.82	8550	8440	-110
Krishna Hamsa	115.88	110.00	112.94	8550	8560	-10
Vikas	107.75	98.63	103.19	8550	8880	330
Tulsi	109.88	107.38	108.63	8550	8684	-134
IR-64	101.80	96.88	99.34	8550	8560	-10
Tellahamsa	113.75	111.88	112.82	8550	8440	-110
IET 9818	128.75	123.75	126.25	8550	7360	-1190
IET 8883	112.25	98.13	105.19	8550	8520	-30
IET 8886	99.50	98.75	99.13	8550	9040	490
IET 8887	100.00	91.00	95.50	8550	9360	810
IET 9691	112.38	109.38	110.88	8550	8600	50
IET 9979	101.75	97.50	99.63	8550	8760	210
IET 9815	117.25	109.38	113.32	8550	8360	-190
IET 13659	111.88	105.75	108.88	8550	8000	-550
IET 10890	110.38	102.63	106.61	8550	8440	-110
IET 11689	115.00	106.25	110.63	8550	8560	0.10
IET 11771	111.88	105.00	108.44	8550	8400	-150
IET 12512	105.00	101.13	103.07	8550	8600	-50
IET 9994	103.88	94.38	99.13	8550	9160	610
CD (P=0.05)	9.69	10.45				

weed dry weight (95.50 g m^{-2}) was recorded in IET 8887 followed by IET 8886, IET 9994, IR 64 Rasi and Vikas. The significantly maximum mean weed dry weight (126.25 g m^{-2}) was recorded in IET 9818. Singh (1990) and Singh (1997). The higher grain yield in these varieties was due to higher panicle number and panicle weight and also due to their ability to smother weeds more effectively with other test varieties.

Economics. Among different seed rates, mean maximum net returns (Rs. 1640 ha^{-1}) was recorded by the seed rate of 250 kg ha^{-1} followed by 300 kg ha^{-1} (Rs. 1460 ha^{-1}) while 150 and 200 kg ha^{-1} were not found economically viable. Over the mean of either seed rates or cultivars, maximum net returns of Rs. 810 ha^{-1} was recorded in IET 8887 followed by IET 9994 (Rs. 610 ha^{-1}), IET 8886 (Rs. 490 ha^{-1}), Rasi (Rs. 410 ha^{-1}) and Vikas (Rs. 330 ha^{-1}).

On the basis of these results it can be inferred that rice cultivars like IET 8887, IET 8886, Rasi, Vikas

and IET 9994 have better weed competitiveness with the seed rate of $250 \text{ kg seed ha}^{-1}$ under wet seeded condition for higher grain yields.

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