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Comparative Performance of System of Rice Intensification and Conventional Methods of Rice Cultivation under Kashmir Valley Conditions

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Abstract

A field experiment was conducted during *kharif* of 2006 and 2007 to evaluate the performance of system of rice intensification (SRI) under Kashmir valley conditions. Seven treatments comprising SRI method with varied nutrient sources and the conventional methods of rice cultivation included the recommended and farmer's practice. SRI with recommended NPK and FYM outperformed the conventional methods of rice cultivation with regard to yield attributes, grain and straw yield during both the years. The crop raised with SRI technique receiving recommended NPK + FYM at 10 t/ha registered yield superiority of 15.47 and 19% over farmers practice during 2006 and 2007 respectively and therefore was superior with regard to the net profit realized.

Key words : Rice intensification, Conventional methods, Performance.

System of Rice Intensification (SRI) originated In Madagascar in 1980's as a rice production technology suited to resource poor farmers with relatively more family labor than land and capital. SRI advocates the transplanting of seedlings at an age of 8–12 days, singly and at spacing 25 cm in square planting geometry. Nutrients are to be supplied through organic sources such as FYM or compost combined with manual or mechanical weeding and application of relatively smaller quantities of water with provisions of intermittent drainage. The system has evolved as an empirical practice and has been credited with spectacular grain yields. Reports from more than 20 Asian, Latin American and African continents have shown that principles and methods of SRI have much potential for raising the yields under different circumstances, in environment friendly ways and can raise the factor productivity i.e. land, labor, capital and water. With good use of these practices it has been possible to increase the yield by 50–100% and yield increase of 200–300% has been achieved where the initial level of production was low. Apart from the yield advantage SRI has associated advantage of seed and water saving which are critical inputs in rice production. Variable response to SRI practices has been observed across the different agro-climatic regions. In Jammu and Kashmir state rice being staple food, is cultivated on an area of 2.59 lakh ha with a production of 0.55 million tones and a meager productivity of 16.02 q/ha (1). Kashmir valley characterized by temperate climate with short rice growing season of 140–150 days. In this backdrop the present investigation was conducted to ascertain the suitability of SRI under temperate conditions of Kashmir valley.

Methods

The field experiment was conducted during *kharif* of 2006 and 2007 at Rice Research and Reginal Station (SKUAST-K), Khudwani, Anantnag, Jammu and Kashmir situated at 34^0 N latitude, 74^0 E longitude and an altitude of 1,560 m amsl. The soil of the experimental field was silty clay loam in texture, neutral in reaction (pH 6.9), low in available nitrogen (255 kg/ha), medium in available phosphorus (14.6 kg/ha) and potassium (260 kg/ha). The experiment comprised seven treatments laid out in randomized block design with three replications. For SRI treatments nursery was prepared on raised beds with well decomposed FYM applied at 1 kg/m^2. Seed was sown at 8 kg 100/m^2 sufficient for one hectare area. For SRI treatments irrigation was applied by alternate wetting and drying (AWD). N, P and K were applied at 80 : 45 : 20 kg/ha to all the treatments except SRI with FYM and SRI

without NPK. FYM at 10 t/ha was applied to all the treatments except SRI with NPK only and SRI without NPK and FYM. The gross income was calculated on the basis of the revenue realized from the grain and straw at the prevailing market rates. The treatment details are tabulated below.

Treatment details

Treatments	Seedling age (days)	Seedling no/hill	Spacing (cm)	No. of weedings	Irrigation schedule
SRI with NPK (T_1)	16	1	25 × 25	2 rotary weedings	AWD
SRI with NPK + FYM (T_2)	16	1	25 × 25	2 rotary weedings	AWD
SRI with NPK + FYM (T_3)	16	1	25 × 25	2 rotary weedings	AWD
SRI without NPK or FYM (T_4)	16	1	25 × 25	2 rotary weedings	AWD
SRI with NPK + FYM (20 × 20 cm) (T_5)	16	1	20 × 20	2 rotary weedings	AWD
Recommended practice (T_6)	35	3–4	15 × 15	1 hand weeding	3–5 cm submergence
Farmers practice (T_7)	35	5–8	Random planting 32–35 hills/m^2	1hand weding	3–5 cm submergence up to flowering

Results and Discussion

Effect on Yield Attributes and Yield

All the yield attributing characters responded significantly to the treatments effects. SRI with NPK + FYM (T_1) maintained the superiority in respect plant height, tillers/hill, panicles/m^2, grains/panicle and 1,000-grain weight over the recommended and farmers practice but were statistically at par with SRI with NPK + FYM at a spacing of 20 × 20 cm (T_5). The effect was more pronounced on the panicles/m^2 and grains/panicle[1], SRI with NPK + FYM (T_1) recorded a superiority of 20 and 38% more panicles/m^2 and grains/panicle[1] over farmers practice during 2006, the corresponding figures for 2007 were 27 and 32% respectively (Table 1). Superior yield attributes for the treatment SRI with NPK + FYM (T_1) manifested itself in the form of significantly higher grain yield by 15.47 and 19% during 2006 and 2007 over farmers practice respectively (Table 1). Strong seedlings for SRI method transplanted at younger age showed no transplanting shock, produced stronger and profuse tillers

Table 1. Growth, yield and yield attributes of rice as influenced by SRI and conventional methods of rice cultivation.

Treatments	Plant height (cm)		Tillers/ hill		Panicles/ m^2		Grains/ panicles	
	2006	2007	2006	2007	2006	2007	2006	2007
SRI with NPK	117.53	118.46	16.46	18.33	209	299	103	108
SRI with FYM	116.26	116.86	15.86	15.42	252	250	97	95
SRI with NPK + FYM	118.06	121.90	19.60	21.76	304	323	115	114
SRI without NPK or FYM	103.13	101.00	11.66	12.40	208	207	78	80
SRI with NPK + FYM (20 × 20 cm)	117.53	121.30	18.13	19.80	295	304	109	108
Recommended practice	101.26	107.13	13.73	14.20	257	249	84	87
Farmers practice	99.26	102.63	13.10	12.30	253	254	83	86
CD (0.05)	6.46	5.27	2.35	2.27	35.65	33.72	11.50	11.44
CV (%)	11.25	8.9	8.34	7.80	8.77	7.03	10.5	9.8

Table 1. Continued.

Treatments	1000 grain weight (g) 2006	2007	Grain yield q/ha 2006	2007	Straw yield q/ha 2006	2007	Harvest index (%) 2006	2007
SRI with NPK	24.76	25.00	74.96	76.1	90.25	86.10	45.37	46.91
SRI with FYM	25.43	24.96	64.59	67.5	80.45	78.60	44.53	46.20
SRI with NPK + FYM	26.70	26.76	80.74	80.4	96.34	95.49	45.55	45.71
SRI without NPK or FYM	24.86	23.50	61.48	60.2	69.13	68.44	47.00	46.79
SRI with NPK + FYM (20 × 20 cm)	25.26	25.73	77.18	76.5	94.56	93.84	44.94	44.91
Recommended practice	23.93	24.00	68.96	68.2	78.65	76.60	46.71	47.09
Farmers practice	23.60	23.66	69.92	68.70	78.17	75.34	47.21	47.69
CD (0.05)	1.63	1.26	8.91	9.67	15.63	9.51	2.38	1.82
CV (%)	8.86	9.8	7.13	7.32	10.52	12.95	11.50	1.44

Table 2. N, P and K uptake and relative economics as influenced by SRI and conventional methods of rice cultivation.

Treatments	Uptake (kg/ha) 2006 N	P	K	2007 N	P	K	Relative economics Production cost/ha (Rs)	Gross income/ha (Rs)	Net profit/ ha (Rs)	B : C ratio
SRI with NPK	145.25	28.64	137.74	148.89	26.14	132.14	37000	89766	52766	1.42
SRI with FYM	128.63	27.54	125.39	145.03	25.39	115.49	37800	78884	41084	1.09
SRI with NPK + FYM	164.16	28.18	158.96	158.76	29.33	154.30	40300	96056	55756	1.38
SRI without NPK of FYM	98.49	18.33	110.36	93.45	24.81	102.78	34300	71946	37646	1.09
SRI with NPK + FYM (spacing 20 × 20 cm)	154.91	34.8	154.34	161.32	32.06	149.70	40300	92049	51749	1.28
Recommended practice	117.97	17.8	112.44	114.73	18.24	115.46	36500	81113	44613	1.22
Farmers practice	115.58	16.90	108.34	112.16	17.66	111.46	36000	81702	45702	1.26
CD (0.05)	18.32	8.47	20.14	11.80	4.41	18.26				
CV (%)	7.63	10.20	8.49	10.45	7.24	8.10				

supported by a prolific and deeper root system resulted in higher grain yield and straw yield for SRI treatments in general and SRI with NPK + FYM (T_1) in particular. Proportionally higher straw yield under SRI method resulted in marginally lower harvest index than recommended (T_6) and farmers practice (T_7). These observations corroborate the findings of Ang Shengfu et al. (2) and Satyanarayana (3).

Effect on Nutrient Uptake

The total above ground nutrient uptake was significantly affected by various treatments. Highest N, P and K uptake was recorded for SRI with NPK + FYM (T_1) which averaged at 161.5, 34.2 and 156.6 kg/ha thereby showing an increase of 42, 66 and 42% over the N, P and K uptake recorded for the farmers practice (T_1) respectively (Table 2). This amply demonstrated that nutrient uptake is not only supply dependent but is also governed by growing conditions provided to the rice plant. Vigorous shoot growth supported by prolific and deeper root system leads to greater nutrient accumulation and higher biomass production thus resulting in higher nutrient uptake. These findings are agreement with the the findings of Barison (4).

Relative Economics

SRI with NPK recorded highest B : C ratio but highest net profit of Rs 55, 756 was realized for the treatment of SRI with NPK + FYM (Table 2).

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