

Performance of rice under different methods of sowing and weed management

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Rice (*Oryza sativa* L.) is the most important staple food which not only fulfill local requirements but also contributes to foreign exchange. In Madhya Pradesh, rice is cultivated in an area of 17 lakh hectares with the production of 24 lakh tonnes. The average productivity of rice is 1413 kg/ha which is very low as per national average. Rice is grown in different ways for cultivation of the high-yielding varieties. It is mostly grown through transplanting in spite of the fact that transplanting is cumbersome practice and requires more labour. Transplanting of seedlings is always recommended for high-yielding varieties. On the other hand, farmers are gradually switching over to direct-seeding under puddled condition. Direct-seeding is also recommended for some local varieties due to lack of irrigation and short duration varieties.

The sowing by the recently developed System of Rice Intensification (SRI) showed a

dramatic improvement in rice yield and production two fold more yield (Sudhakara *et al.*, 2017). SRI is a system of growing rice that involves principles that is radically different from the traditional ways of growing rice. Weeds cause substantial losses in rice yield through competition for resources like space, solar radiation, soil-nutrients and moisture. Therefore, timely control of weeds is essential to get maximum yield. Herbicides are considered to be an alternative supplement to hand weeding. Several pre-emergence and post-emergence herbicides including butachlor, bispyribac sodium, pendimethalin, oxadiazon, fenoxaprop ethyl used alone or supplemented with hand weeding have been reported to provide a fair degree of weed control (Pellerin and Webstar, 2004). Keeping the above points in view, the present research was taken up.

Table 1: Growth and yield attributes of rice as influenced by methods of sowing and weed management

Treatments	Plant height (cm) at harvest	Tillers/plant at harvest	Leaves/plant at harvest	Panicles /m ²	Length of panicles (cm)	Grains /panicle	Weight of panicle (g)	1000-seed weight (g)
Methods of sowing								
Direct sowing	92.0	9.3	6.8	287.95	21.73	206	5.03	19.12
Transplanted	98.5	9.8	7.5	291.23	22.64	233	5.38	20.40
SRI	101.4	16.0	8.2	292.05	24.36	273	6.19	21.96
CD (P = 0.05)	NS	0.24	0.39	0.34	0.40	7.079	0.23	1.70
Weed management								
HW (twice)	100.8	13.01	8.6	296.45	24.52	237	5.74	23.00
Bispyribac sodium	98.0	12.62	7.7	293.85	23.54	243	5.57	21.59
Fenoxa prop-ethyl	96.3	12.25	7.2	290.19	22.94	240	5.51	20.42
Weedy check	94.1	8.86	6.3	281.15	20.60	230	5.33	50.93
C.D. (P=0.05)	NS	0.14	0.15	0.164	0.18	3.78	0.15	1.09

The field experiment was conducted at the Research Farm, College of Agriculture, Rewa (M.P.) during *kharif* season 2017. The field soil was sandy-loam in texture having pH 6.60, electrical conductivity 0.14 dSm⁻¹, organic carbon 6.0 g kg⁻¹, available N, P₂O₅ and K₂O

240, 13.6 and 246 kg ha⁻¹, respectively. The experiment was laid out in split-plot design with three replications. The treatments comprised of three sowing methods (direct-seeding, transplanted and SRI methods) in the main-plots and four weed control methods (HW 20 and 40

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DAS/DAT, bispyribac sodium @200 ml ha⁻¹, fenoxaprop ethyl @1.0 lit. ha⁻¹ and weedy check) in sub-plots. The rice var. MTU-1010 was sown or transplanted as per treatments on 21 July, 2017. The uniform dose of 120 kg N, 60 kg P₂O₅ and 40 kg K₂O ha⁻¹ was applied in all the treatments. The crop was grown under the recommended package of practices.

The results (Table 1) indicated that out of the sowing methods, the SRI method proved significantly increased the plant growth (16 tillers plant⁻¹, 8.15 leaves plant⁻¹), yield attributes (291 panicles/m², 24.36 cm panicle length, 273 grains panicle⁻¹, 6.19 g panicle weight and 21.96 g 1000-seed weight) and ultimately grain yield (25.40 q ha⁻¹) as well as net income (Rs.48058 ha⁻¹ with 2.38 B:C ratio). This was followed by

transplanted method (21.13 q ha⁻¹) and then direct-seeding i.e. 18.63 q ha⁻¹ (Table 2). The best performance of SRI was due to the unique effect of this system of growing rice that involves principles that is radically different from traditional ways of growing rice. It involves single seedling transplantation of young seedlings with care instead of conventional method of transplanting having multiple and mature seedlings from the nursery. The SRI method provides rice plants more space and does not require continuous flooding of rice fields with less seed and chemical inputs. It helps in promoting soil biotic activities in and around root-zone of the plant. These results are in close conformity with the findings of Sekhar *et al.* (2009) and Mahajan *et al.* (2014).

Table 2: Effect of methods of sowing and weed management on yield and economics of rice

Treatments	Grain yield (q ha ⁻¹)	Straw yield (q ha ⁻¹)	Harvest index (%)	Net income (Rs ha ⁻¹)	B:C ratio
Methods of sowing					
Direct sowing	18.63	42.63	30.45	34352	2.31
Transplanted	21.13	49.01	30.09	30734	1.81
SRI	25.40	61.16	29.36	48058	2.38
CD (P = 0.05)	0.10	6.27	2.36	-	-
Weed management					
HW (twice)	26.47	61.07	30.5	49184	2.37
Bispyribac sodium	22.83	53.45	30.04	42001	2.34
Fenoxa prop-ethyl	21.14	49.03	30.13	36499	2.17
Weedy check	16.49	40.17	29.2	23174	1.79
C.D. (P=0.05)	0.08	2.20	0.86	-	-

Amongst the weed management practices, HW (twice) proved significantly superior to bispyribac sodium and fenoxaprop herbicides and weedy check. The process of HW enhanced the plant growth, yield and yield-attributes significantly (Table 1). The grain yield was 26.47 q ha⁻¹, followed by bispyribac sodium (22.83 q ha⁻¹), fenoxaprop (21.14 q ha⁻¹) and then weedy check (16.49 q ha⁻¹). Consequently, the net income was found highest (Rs.49184 ha⁻¹ with 2.37 B:C ratio) under HW twice, followed by Rs.42001 ha⁻¹ with 2.34 B:C ratio under bispyribac sodium and Rs.36499 ha⁻¹ with 2.17 B:C ratio under fenoxaprop. The lowest income was only Rs.23174 ha⁻¹ with 1.79 B:C ratio under weedy check (Table 2). The hand weeding is well known for its best control of all types of weeds. In this process all the weeds are removed from the field along with their roots. The chances of their revival or re-emergence are

almost rare. Consequently, the weed competition with the crop plants for space, light, moisture and nutrients are also become very less. Under the favourable soil conditions, the crop growth speeds up with the increased photosynthetic process, thereby yield-attributes and yield. On the other hand, the effect of applied selective and most effective herbicides can not give results upto that extent as in case of hand weeding. However, both the applied herbicides proved significantly superior to weedy check. These results are also in cognizance with those of Ramachandiran *et al.* (2012), Rajendra *et al.* (2013) and Chauhan *et al.* (2015).

The findings concluded that the rice var. MTU 1010 grown with SRI method of sowing along with hand weeding (twice) resulted in maximum grain yield and net returns under the existing agro-climatic conditions of this region.

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