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Short Communication

Performance of rice (*Oryza sativa*) varieties under different sowing methods in Kymore plateau

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Rice (*Oryza sativa* L.*)* is a staple food of India which occupies an area of 43.9 million hectare with production of 106.65 million tonnes. The average productivity is 2426 kg ha^{-1}. In Madhya Pradesh, rice is cultivated on an area of 17.03 lakh hectares with the production of 24.01 lakh tonnes. The average productivity of rice is 1413 kg ha^{-1} which is very low as per national average. It is due to use of local varieties, erratic and uneven distribution of rainfall and traditional methods of sowing. Rice is grown in different ways for cultivation of the high-yielding varieties. Rice is grown mostly through direct dry- seeding, direct wet- seeding (*Lehi*) and transplanting methods. The System of Rice Intensification (SRI) showed a dramatic improvement in rice yield and produced two fold more yield (Sudhakara *et al.,* 2017). SRI is a 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 multiple and mature seedlings from the nursery. SRI 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. Mahajan *et al.* (2014) and Khatoon *et al.,* (2018) reported that the rice varieties Sahbhagi and MTU-1010 sown with SRI method gave significantly higher yield. The information is scanty on the suitable varieties grown under proper crop establishment practices for Kymore plateau. Therefore, keeping the above facts in view, present experiment was carried out in *kharif* season of 2018 using rice as test crop.

A field experiment was conducted at the Instructional Farm, JNKVV College of Agriculture, Instructional Farm, Rewa (M.P.) under All India Coordinated Rice Improvement Project. The experimental field was sandy-loam in texture. The soil pH was 6.50 electrical conductivity, 0.43-0.48 dS m^{-1}, organic carbon 5.4-5.9 g kg^{-1}, available N, P_2O_5 and K_2O 290-327, 16-18 and 304-411 kg ha^{-1}, respectively. The treatments comprised of 3 varieties (PS-3, PS-4 and PS-5) in main-plots and 4 sowing methods (direct-seeding, *Lehi,* transplanted and SRI) in the sub-plots and. The experiment was laid out in split-plot design with four replications. The varieties were sown as direct-seeding on 5 July, by *Lehi* on 17 July, and by transplanting on 18 July, 2018. The uniform dose of fertilizers (100 kg N, 60 kg P_2O_5 and 40 K_20 ha^{-1}) was applied in all the treatments. The crop was grown under recommended package of practices. It was harvested between 25October to 5 November under different sowing methods. Growth characters, yield attributes and yield were recorded at harvest.

The data (Table 1) indicate that the SRI planting method produced significantly maximum plant height (97.6 cm), number of tillers 253/m^2 leaves 44.4 $plant^{-1}$ than other planting methods. The better growth of plant under SRI might be due to the planting of younger 13 days-old seedlings which might have encouraged vigorous, taller and profuse tillering with increased number of leaves.. Similar findings pertaining to differential response of sowing methods were also reported by Dabbas (2012), Hussain *et al.* (2013), Kumar *et al.* (2018) and Khatoon *et al.* (2018). The variety PS-5 showed superiority with respect to plant height (92.6 cm), number of tillers (252/m^2) and leaves (43.4 $plant^{-1}$) as compared to other varieties. The variation in growth parameters may be due to variation in the genetic characters of the varieties. These findings are in agreement with the findings of Mahajan *et al.* (2009), Mahajan *et al.* (2014) and Kumar *et al.* (2018).

The number of panicles (246.0/m^2), panicle length (26.1 cm), grains/panicle (173.8), test weight (23.12 g), filled grains/panicle (157.8)

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Table 1: Growth, yield-attributes, yield and economical gain from rice varieties grown under different sowing methods

Treatments	Plant height (cm)	Tillers/ m^2 at 60 DAS	Leaves $plant^{-1}$ at 60 DAS	Panicle/ m^2	Length of panicle (cm)	Grains/ panicle	Filled grains/ panicle	Test weight (g)	Grain yield (q ha^{-1})	Straw yield (q ha^{-1})	Harvest index (%)	Net income (Rs ha^{-1})	B:C ratio
Sowing methods													
Direct sowing	79.7	229	37.0	227.3	21.6	168.1	149.6	20.53	27.5	69.6	28.17	34927	2.23
Lehi	90.6	242	38.8	231.3	23.1	170.2	152.7	21.68	30.0	69.2	30.46	38224	2.32
SRI	97.6	253	44.4	246.0	26.1	173.8	157.8	23.12	43.3	90.5	32.28	58382	2.56
Transplanting	93.4	252	40.2	244.7	24.4	171.6	154.6	22.05	36.5	80.1	31.33	44348	2.10
C.D. (P=0.05)	3.58	2.71	3.57	15.08	0.41	1.50	1.39	0.37	4.27	5.83	0.42	--	--
Varieties													
PS-3	88.1	232	37.0	232.2	23.0	168.3	151.2	21.28	29.2	69.4	29.60	32590	2.01
PS-4	90.2	248	40.0	240.5	23.9	171.5	154.2	21.90	34.6	77.0	30.37	43850	2.33
PS-5	92.6	252	43.4	239.2	24.3	173.0	155.5	22.36	39.1	85.7	31.72	53971	2.62
C.D. (P=0.05)	NS	3.90	5.14	NS	0.59	2.16	2.00	0.53	6.15	7.11	0.60	--	--

were significantly higher in SRI method as compared to direct-seeding, *Lehi* and transplanted methods. These those are close conformity with the findings of Thakur *et al.* (2010), Dabbas (2012), Mahajan *et al.* (2014) and Kumar *et al.* (2018).

Amongst the rice varieties, PS-4 and PS-5 exhibited superiority with respect to panicle number and length of panicle, test weight and filled grains/panicle which are the main contributors of grain yield. It might be due to the differential genetic make up of the varieties over PS-3 variety. The present findings corroborate with those of many researchers (Mahajan *et al.,* 2009; Sridhara *et al.,* 2011; Mahajan *et al.,* 2014 and Khatoon *et al.* (2018). The grain (43.3 q ha^{-1}) and straw yield (90.5 q ha^{-1}) were found highest under SRI planting as compared to direct-seeding method (grain yield 27.5 q and straw yield 69.6 q ha^{-1}). The superiority of SRI method with respect to yield was because of the more number of effective tillers or panicles/m^2, test weight, filled grains/panicle recorded as compared to those under direct seeding method. These results agree with those of Thakur *et al.* (2010); Dass *et al.* (2010); Mahajan *et al.* (2014) and Kumar *et al.* (2018). The variety PS-5 produced the highest grain yield (39.1 q ha^{-1}), straw yield (85.7 q ha^{-1}) and harvest index (31.72%) over PS-4 and PS-3 varieties. It might be due to the differences in the varietal vigour, genetic differences and yield potential among the varieties. Similar type of results have also been reported by Mahajan *et al.*(2009), Mahajan *et al.*(2014) and Khatoon *et al.*(2018).

The maximum net return was obtained under the SRI planting (Rs.58382 ha^{-1}) and lowest under direct-seeding (Rs.34927 ha^{-1}) with the B:C ratios 2.56, 2.10 and 2.23, respectively. Among the rice varieties, PS-5 gave the maximum net return (Rs.53971 ha^{-1}), followed by PS-4(Rs.43850 ha^{-1}).The lowest net return (Rs.32590 ha^{-1}) was recorded in case of PS-3 variety with the B:C ratio of 2.01, respectively. It may be concluded that PS-5 variety of rice and SRI method of sowing was found the best under the existing agro - climatic conditions of Kymore plateau.

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