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Rice cultivation under system of rice intensification (SRI) - A novel path towards resource saving

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ABSTRACT

An experiment was conducted at Agricultural Research Farm of Lovely Professional University during the kharif season of 2018-19 on evaluation of rice intensification system in central plain zone of Punjab. Pusa Basmati 1121 was replicated thrice in randomized block design design having 9 treatments by using fertilizers and vermin-compost. Seeds primed with different priming materials and non primed seeds were used under system of rice intensification method (SRI) of rice cultivation. The results of the experiment showed higher paddy yield under SRI method with primed seeds. Highest paddy yield (93.9 q/ha) and 1000 grain weight (6.72 g) was observed under the treatment applied with 100% NPK(Nitrogen, Phosphorous and Potash) along with cow urine treated seeds.

Key words: *Cow urine**;** paddy; priming.*

INTRODUCTION

System of rice intensification being a resource conservation approach relies upon lesser use of seeds, water, fertilizers, labour, energy etc. alongside avoidance of water, air and soil pollution. Uphoff, 2004[1] reported enhanced rice yield at lower cultivation cost by SRI method of rice cultivation. In Malaysia, adoption of SRI practices improved productivity of rice[2]. In different experiments conducted by various researchers, SRI proved to be a better option in terms of more height of plant, tillers, panicles, leaf area, dry matter, and straw and grain yields compared to traditional transplanting of rice [3-13]. Increased gross and net return by SRI method of rice cultivation as compared to the conventional or traditional method was also registered [4,13]. Seed priming is a hydration technique at least cost. Seed priming resulted in better crop stand

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and seed vigour [14, 15]. Priming of seed improved the seed germination, seedling emergence and crop stand, abiotic and biotic stress tolerance [13, 16]. Seed priming improved the chilling tolerance during seed germination and seedling growth in Tobacco [17]. The studies were conducted to evaluate the effect of different priming materials and methods on physiological potential of rice seeds having diverse types of results.

Priming of seeds by using selenium and salicylic acid enhanced the rice growth under stress conditions [18]. Among three different priming materials like Polyethylene glycol, Potassium nitrate and hydropriming, the later one was proved as the best method over two methods [19].Osmohardening with $CaCl_2$ also caused higher root and shoot length, soluble sugars and dry weight of seedlings [20]. In direct seeded rice, priming of seeds reported to have better germination, yield and quality of rice grain [21]. By keeping in view the importance of SRI and seed priming the following study was conducted.

MATERIALS AND METHODS

The field experiment entitled was conducted in *kharif* season at Lovely Professional University, Phagwara, Punjab (India) during 2018. The study area is situated in central plain zone of Punjab at an altitude of 252 m above mean sea level at 31°15'N and 75°42'E. There were 9 treatments comprising Hydropriming, 1% KNO_3, 1% Cow urine, Hydropriming was done by soaking rice seeds in deionized water for 24 hours at room temperature and in 1% KNO_3 and in 1% cow urine according to the treatments. In case of non priming, seeds were soaked in tap water for 24 hours at room temperature. 15 days old seedlings were transplanted in the main field at young stage in wider square pattern at fixed spacing of 25 cm × 25 cm under the SRI technique. Single seedling was transplanted per hill at 2-3 leaf stage.

RESULTS AND DISCUSSION

Growth parameters

At 60 DAS, plant height ranged from 107 to 123 cm for control and 100% NPK applied treatment without seed priming respectively. Maximum number of leaves and tillers per plant were noticed under T5 treatment to the tune of 123 and 27 respectively followed by T4 in case of leaves and T8 as number of tillers per plant is concerned (Table 1). The results are also in agreement with Gani *et al.,* (2002)[22] that 14 days old plants were taller and produced higher

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number of tillers per plant. Saha and Bharti [23] during 2010 also reported maximum plant height and number of tillers/m^2 by this method as compared to other methods of rice cultivation.

Table 1: Growth attributes in paddy as affected by different priming treatments under SRI

Treatments	Plant height (cm)	Number of leaves/plant	Number of tillers/plant
T1- SRI control	107.2	99.6	21.0
T2- 100% NPK+ without seed priming	122.9	115.0	23.6
T3- 100% NPK+ Hydropriming	119.3	115.0	23.3
T4- 100% NPK+ 1% KNO_3	122.9	116.3	24.6
T5- 100% NPK+ 1% Cow urine	120.3	123.3	27.0
T6- 50% NPK+ 50% vermicompost+ without seed priming	114.7	112.0	24.6
T7- 50% NPK+50% vermicompost + Hydropriming	115.1	102.0	22.6
T8- 50% NPK+ 50% vermicompost + 1%KNO_3	121.1	112.0	25.3
T9- 50% NPK+ 50% vermicompost + 1%Cow urine	122.3	114.3	25.0

Yield parameters

Panicle number, panicle length, panicle weight, weight of 1000 grains, paddy yield and straw yield was observed. Panicle number per plant in paddy showed a wide range of variation i.e. from 29 to 74 under control and treatments applied with recommended dose of fertilizers and seed primed with 1% cow urine (Table 2). Panicle length (33.6 cm) and panicle weight per plant (161g) was observed maximum in T4 treatment. Highest test weight (6.72g) was observed for T5

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treatment followed by T6. Kumar *et al*., (2004) also reported increased panicle number and panicle length in SRI than the traditional method of rice cultivation. Paddy yield (Fig.1) showed that cow urine primed seeds when applied with recommended or full dose of fertilizer lead to highest yield (92 q/ha) under the treatment (T5) which was also statistically at par with the treatment (T9) 50% NPK+ 50% VC+ 1% cow urine. There was increase of almost 37% in yield of T4 treatment as compared to SRI control, however lowest paddy yield (56.5 q/ha) was observed under control. Omwenga *et al*., (2014) reported that SRI produced higher yield than the traditional method with increment of 46%. Ponni *et al*., (2010)[24] also observed similar increase in yield attributes under SRI compared to the conventional method. Treatments T1, T4 and T5 showed decline in straw yield from control plot straw yield may be due to more increment in paddy yield under various treatments (Fig. 2). The highest straw yield (557 q/ha) was recorded in T2 treatment and lowest in T4 treatment.

Table 2: Yield and yield contributing characters in paddy under SRI

Treatments	**Number of panicles/plant**	**Panicle length (cm)**	**Panicle weight (g)**	**Test weight (g)**
T1- SRI control	29.3	25.3	144.0	5.96
T2- 100% NPK+ without seed priming	49.3	31.3	144.0	6.39
T3- 100% NPK+ Hydropriming	31.3	27.0	56.0	5.00
T4- 100% NPK+ 1% KNO_3	35.3	27.0	112.0	6.04
T5- 100% NPK+ 1% Cow urine	74.0	33.6	161.0	6.72
T6- 50% NPK+ 50% VC+ without seed priming	46.6	32.3	67.0	6.48
T7- 50% NPK+50% VC+ Hydropriming	32.0	31.3	134.0	5.62

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T8- 50% NPK+ 50% VC+ 1%KNO_3	67.3	33.3	52.0	6.18
T9- 50% NPK+ 50% VC+ 1%Cow urine	74.0	30.0	70.0	6.41

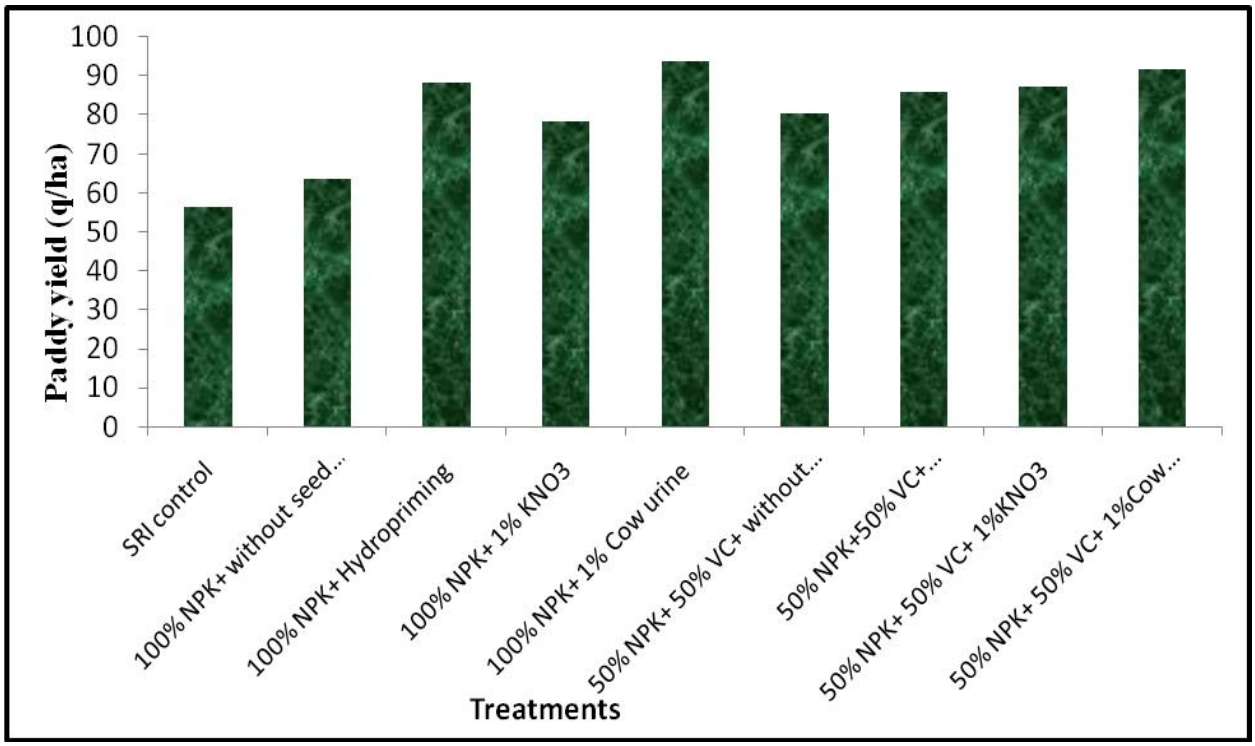

Figure 1. Paddy yield under different SRI treatments

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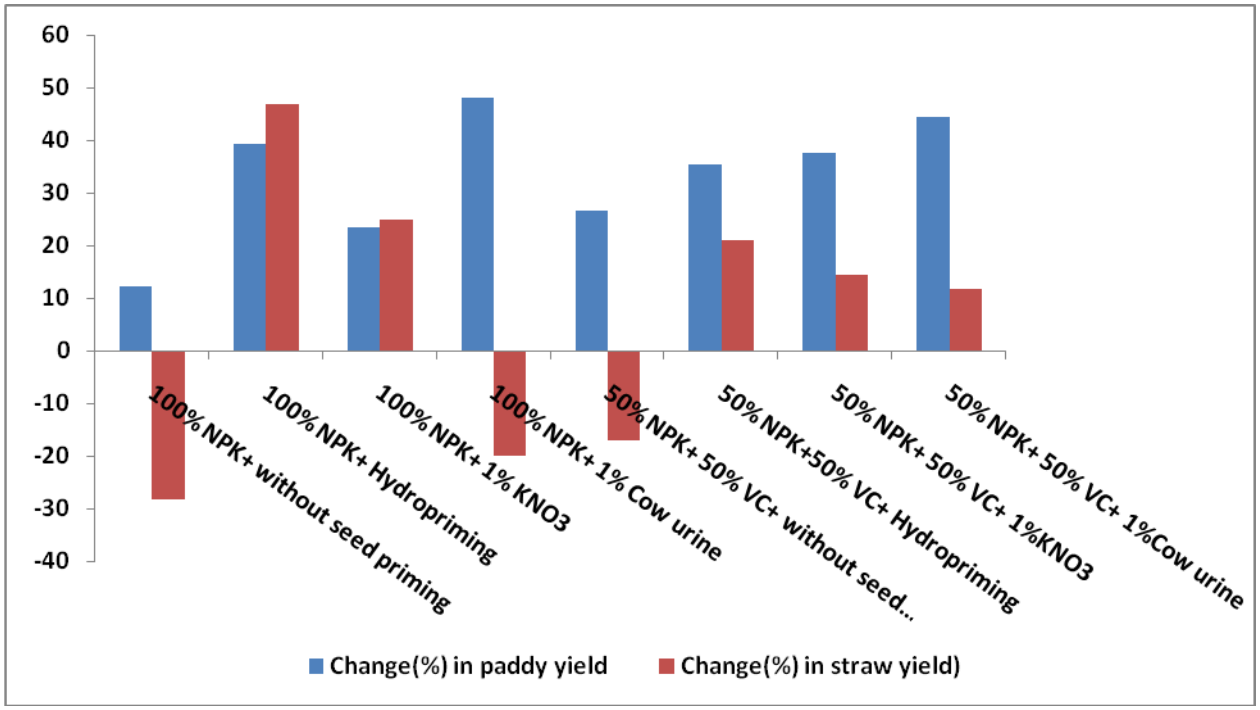

Figure 2. Deviation of paddy and straw yield from control under different SRI treatments

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