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# Suitability of elite genotypes for wet-direct seeding in rice-rice system in Vertisol

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## ABSTRACT

*This study was conducted to evaluate few elite rice genotypes in wet-direct seeded system vis-à-vis conventional transplanting in clayey vertisol of Telangana during two consecutive seasons (rabi and kharif) of 2015-16. The experiment was laid out in split-plot design with two methods of crop establishment in main plots viz. conventional transplanting (CT) and direct seeded rice (DSR) in puddled condition with nine rice varieties of different growth duration in sub-plots and replicated thrice. Growth and yield attributing characters were not differed in both the establishment techniques. Grain yields during the rabi season was higher by about 1.5 % under DSR, whereas, during kharif it was about 1 % higher in transplanted rice. Total duration of cultivars was decreased in DSR to the tune of 14 days during two seasons. There was no significant difference in mean grain yield across rice cultivars in two consecutive growing seasons between direct seeding and conventional transplanting. During rabi season DRR Dhan 44, Rasi, DRRH-2, HRI-174, RNR 15048, RP Bio-226 performed well; whereas Rasi, DRR Dhan 44, DRRH-2 and Varadhan found suitable in kharif.*

***Key words:*** *Transplanting, wet-direct seeded rice, rice variety, labour scarcity, rice-rice, yield advantage*

## INTRODUCTION

Rice is the world's most important crop and is a staple food for more than half of the world population. Worldwide, rice is grown on about 167 Mha, with an annual production of about 770 Mt of paddy and 90% of world's rice is produced in Asia (FAOSTAT, 2017). In Asia, rice is commonly grown by transplanting seedlings into puddled soil (land preparation with wet tillage). Moreover, conventional transplanting of rice requires a large amount of human workforce for uprooting, carrying and transplanting the seedlings into the field. Rice cultivation in South Asia is facing different challenges among which labour and water scarcity are major, making rice cultivation non-profitable (Pandey and Velasco, 1999). Also, drudgery involved in rice transplanting, which is mainly done by female workers is of serious concern. In light of the high energy costs and increasingly scarce resources, future agricultural systems have to be more productive, profitable and more efficient in terms of inputs. All these factors demand major shift from transplanting to direct seeding in wet condition in irrigated areas. Wet puddled direct seeding is a potential alternative for rice cultivation (Kumar and Ladha, 2011) in areas where rice-rice system prevails specifically in Andhra-Telangana region of India. Wet-direct seeded rice is attractive to the farmers due to acute labour shortages in assured irrigation fed areas (Mishra et al., 2017; Balasubramanian and Hill, 2002). Researchers also witnessed comparable response in direct seeding (*viz*., wet, dry or water seeding) and transplanting with respect to grain yield (Kukal and Aggarwal, 2002).Whereas, varietal improvement programme on rice mainly focused on developing rice varieties for conventional transplanted puddled system which leads to less popularity of direct seeded rice (Farooq et al., 2011) and availability of many high yielding rice varieties and few hybrids in different rice growing ecologies made possible the rice production of India a surplus. Rice varieties used for transplanted

condition are being used for DSR without judging their potential to perform in direct seeded methods. Identification of varieties suitable for direct seeding is also of immense importance for enhancing productivity and profitability. Limited information is available on suitability of rice varieties (originally bred for conventional transplanting) for direct seeding particularly for wet-direct seeding. ICAR-Indian Institute of Rice Research, Hyderabad (IIRR) since its inception has developed a number of rice varieties and many of them are very popular among rice growers. Our objective of this study was to find suitable cultivars for wet-DSR system from some popular rice varieties released from IIRR along with two other popular rice varieties which were used for comparison.

## MATERIALS AND METHODS

### Experimental site, climate and soil

The study was conducted in two consecutive seasons extending from December, 2015 to May, 2016 (dry season; known as *rabi*) and July 2016 to December 2016 (wet season; known as *kharif*) at Rajendranagar farm of IIRR, Hyderabad (17°19'34"N, 78°23'01"E).

The cumulative rainfall recorded during December 2015 to December 2016 was 1005 mm which was received mostly during the wet season. Maximum and minimum temperatures (Fig. 1) ranged between 27.5-42.5 °C and 10.5-27.5 °C, during dry season; and 23-34 °C and 7-24 °C during wet season, respectively. The soil of the experimental plot was clayey in nature with pH of 7.8 to 8.3, available nitrogen 168 kg $ha^{-1}$, phosphorus 70 kg $ha^{-1}$, and potassium 306 kg $ha^{-1}$. The soil test was based on samples taken from the upper 15 cm of the soil.

### Treatment details

The experiment was laid out in split-plot design with two methods of crop establishment in main plots *viz*., conventional puddled transplanting (CT) and direct seeded rice (DSR) in puddled condition and nine rice varieties (Table 1) of different growth duration in sub-plots. Rice varieties *viz*., Rasi, DRR Dhan-44, DRRH-2, HRI-174, RNR-15048, Varadhan, Sampada, Jaya and RP Bio-226 were evaluated for their performance in sub-plots. The experiment was replicated three times and sub-plot size was 12 $m^2$.

### Field and crop management

In both the seasons, land preparation in experimental plots was done with two passes by a power tiller followed by two laddering before sowing or transplanting. Twenty five days old seedlings were transplanted in main field at a spacing of 20 cm x 10 cm; at each hill, two to three seedlings were transplanted in conventional transplanting. In direct seeding, 2-3 sprouted seeds were dibbled manually at 20 cm x 10 cm spacing in puddled field with no or negligible standing water on surface. The nursery for transplanting and main field sowing in DSR was conducted on the same date to synchronize the weather condition. During *rabi* and *kharif* sowing was conducted on 8$^{th}$ January and 16$^{th}$ July, respectively. Nutrient management for both the seasons was accomplished as per recommended practices for the region *i.e.*, 120 kg N, 60 kg $P_2O_5$ and 40 kg $K_2O$ were applied per hectare basis through urea, single super phosphate and muriate of potash in both CT and DSR. Alternate wetting and drying was followed for managing water requirement of the crop. Irrigation was applied until soil water regime reaches field capacity. Diseases and insects were intensively controlled by using chemicals means, whenever needed. Weed management was achieved by a combination of herbicide and hand-weeding as necessary. However, no heavy infestations of disease and insect pests were recorded during the experiments. Plants were separated into straw (including rachis) and spikelets by hand threshing then grain yield, straw yield, panicle weight, grain per panicle and 1000-grain weight were recorded.

$$\text{Harvest index (\%)} = \frac{\text{Grain yield}}{\text{Biological yield}} \times 100$$

$$\text{Per day grain production } (kg^{-1}ha^{-1}day^{-1}) = \frac{\text{Grain yield}\left(\text{kg ha}^{-1}\right)}{\text{Duration from emergence to maturity (day)}}$$

### Statistical analysis

Statistical analysis was performed using Statistix 8.1, analytical software, Tallahassee, Florida, USA and subjected to the analysis of variance under split-plot design. The differences between treatment means were estimated using Tukey's HSD test at the 0.05 probability

**Table 1.** Information on rice varieties used in the study.

| Cultivar | Duration | Type | Year of release | Grain type | Developed by |
|---|---|---|---|---|---|
| Rasi | 115 | Irrigated Early | 1978 | Medium Bold | IIRR |
| DRR Dhan-44 | 115-120 | Irrigated Early | 2014 | Long Slender | IIRR |
| DRRH-2 | 115 | Irrigated Early (Hybrid) | 2005 | Long Slender | IIRR |
| HRI-174 | 130-135 | Irrigated Medium (Hybrid) | 2015 | Medium Slender | Bayer Crop Science,Hyderabad |
| RNR-15048 | 125 | Irrigated Mid-Early | 2015 | Short Slender | PJTSAU, Hyderabad |
| Varadhan | 120-125 | Irrigated Mid-Early | 2008 | Short Bold | IIRR |
| Sampada | 130-135 | Irrigated Medium | 2008 | Medium Slender | IIRR |
| Jaya | 130-135 | Irrigated Medium | 1969 | Long Bold | IIRR |
| RP Bio-226 | 135-140 | Late | 2008 | Medium Slender | IIRR |

level. Wherever, statistical significance were observed, different letters (*i.e.*, a, b or m, n) is mentioned for comparison. Different graphs were prepared using Microsoft Excel (Office 2016).

## RESULTS AND DISCUSSION

### Growth and yield attributes

No significant difference was found in terms of plant height, tiller number, panicle weight, grains per panicle and 1000-grain weight between CT and DSR during both the seasons. Although, different results were reported by Sudhir Yadav et al. (2014) where tiller density was significantly higher in wet seeding compared to puddle transplanting. Plant height, which is a varietal character in standard management practice, was found higher in DRR Dhan 44 during both the seasons. Significantly higher plant height was recorded in DRR Dhan 44, HRI 174, Varadhan and RNR 15048 during *rabi* (Table 2). No statistical difference was found in plant tillers per $m^2$ in different cultivars during *rabi* season (Table 2). Whereas during *kharif* tiller number per $m^2$ was significantly greater in Jaya and RP Bio-226; very low tiller number were observed in Rasi variety.

During *rabi*, significantly higher mean panicle weight were observed in DRRH-2 and Varadhan;

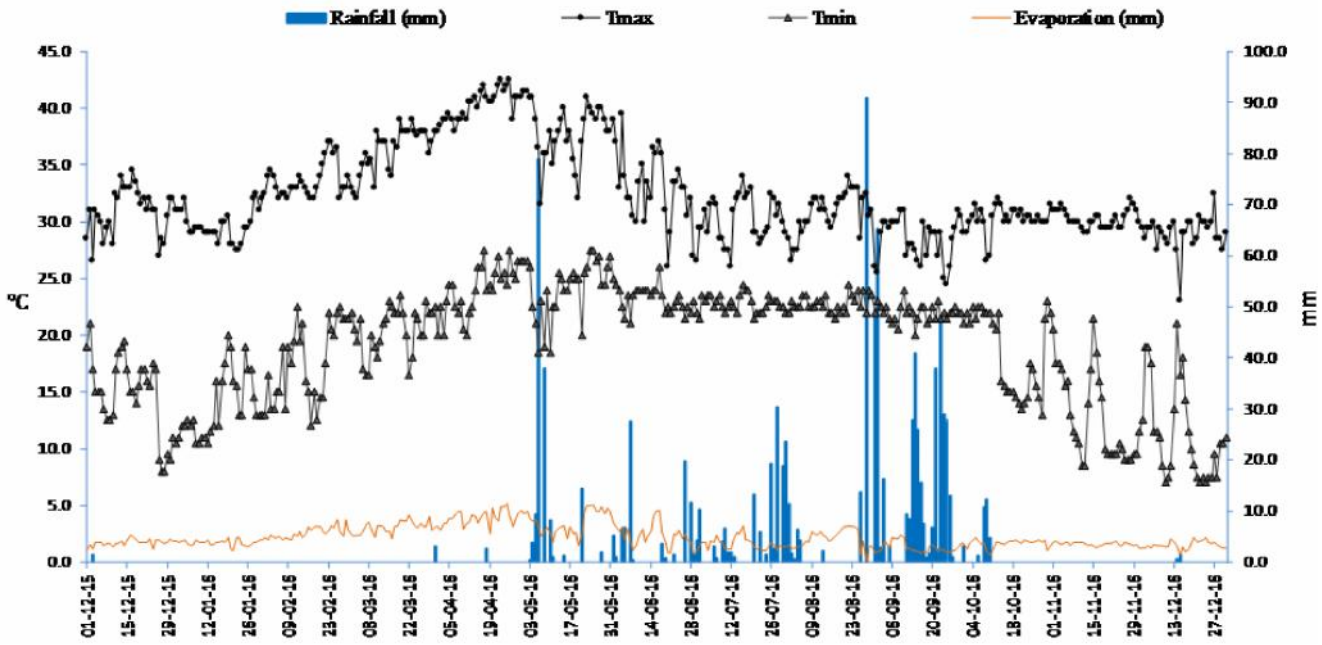


**Fig. 1.** Weather condition (rainfall, maximum temperature, minimum temperature and daily evaporation) during study period.

**Table 2.** Plant height, number of tillers per $m^2$ of rice as influenced by establishment techniques and cultivars.

| | *Rabi* 2015-16 | | | | | | *Kharif* 2016 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Plant ht. (cm) | | | Tiller $m^{-2}$ | | | Plant ht. (cm) | | | Tiller $m^{-2}$ | | |
| **Cultivar** | CT | DSR | Mean | CT | DSR | Mean | CT | DSR | Mean | CT | DSR | Mean |
| Rasi | 76.2 | 84.0 | 80.1 ab | 433 | 400 | 417b | 77.6 | 71.4 | 74.5 bcd | 379 | 390 | 385 b |
| DRR Dhan 44 | 86.9 | 90.8 | 88.8 a | 400 | 439 | 419b | 92.2 | 87.8 | 90.0 a | 388 | 435 | 412 ab |
| DRRH-2 | 71.7 | 69.5 | 70.6 bc | 511 | 550 | 531a | 80.0 | 74.0 | 77.0 bc | 406 | 480 | 443 ab |
| HRI 174 | 85.1 | 89.0 | 87.1 a | 417 | 489 | 453ab | 77.5 | 79.4 | 78.5 b | 454 | 464 | 459 ab |
| RNR 15048 | 79.7 | 87.5 | 83.6 a | 389 | 456 | 422ab | 75.6 | 77.5 | 76.6 bcd | 483 | 481 | 483 ab |
| Varadhan | 81.8 | 88.6 | 85.2 a | 411 | 422 | 417b | 77.4 | 87.6 | 82.5 ab | 458 | 399 | 429 ab |
| Sampada | 59.0 | 68.3 | 63.6 c | 516 | 461 | 489ab | 69.5 | 66.3 | 67.9 cd | 454 | 484 | 469 ab |
| Jaya | 62.3 | 62.7 | 62.5 c | 450 | 433 | 442ab | 68.9 | 64.7 | 66.8 d | 467 | 515 | 491 a |
| RP Bio-226 | 70.7 | 66.1 | 68.4 c | 494 | 466 | 480ab | 67.6 | 66.5 | 67.0 d | 488 | 491 | 489 a |
| Mean | 74.8m | 78.5m | | 447m | 457m | | 76.3m | 75.0m | | 442m | 460m | |

a,b,c,d,e,f- In a column, means followed by different letters for particular set of treatments are significantly different at p = 0.05 using Tukey's HSD. m,n-In a row, means followed by different letters for particular set of treatments are significantly different at p = 0.05 using Tukey's HSD.

whereas during *kharif* all varieties found similar in terms of panicle weight (Table 3). Among varieties, HRI-174 was found superior in number of grains per panicle. Mean panicle weight of different varieties was greater during *kharif* than *rabi* season; it is due to the more grain setting per panicle during *kharif* owing to favourable environment after post rainy period.

**Table 3.** Panicle weight, grains per panicle and 1000-grain weight of rice as influenced by establishment techniques and cultivars.

| | Panicle wt. (g) | | | Grain $panicle^{-1}$ | | | 1000-grain wt. (g) | | |
|---|---|---|---|---|---|---|---|---|---|
| **Cultivar** | CT | DSR | Mean | CT | DSR | Mean | CT | DSR | Mean |
| *Rabi* 2015-16 | | | | | | | | | |
| Rasi | 3.35 | 3.68 | 3.52 ab | 130 | 152 | 141 c | 24.2 | 21.6 | 22.87 a |
| DRR Dhan 44 | 3.81 | 3.71 | 3.76 ab | 180 | 155 | 168 ab | 21.1 | 24.0 | 22.59 a |
| DRRH-2 | 3.79 | 3.97 | 3.88 a | 154 | 173 | 163 b | 24.0 | 23.0 | 23.48 a |
| HRI 174 | 3.53 | 4.05 | 3.79 ab | 184 | 183 | 184 a | 19.1 | 22.2 | 20.69 ab |
| RNR 15048 | 3.93 | 3.64 | 3.78 ab | 172 | 160 | 166 b | 18.5 | 17.1 | 17.84 b |
| Varadhan | 3.89 | 3.80 | 3.85 a | 158 | 166 | 162 b | 24.0 | 22.6 | 23.30 a |
| Sampada | 3.18 | 3.51 | 3.35 ab | 175 | 159 | 167 ab | 18.9 | 22.0 | 20.47 ab |
| Jaya | 3.19 | 3.90 | 3.54 ab | 154 | 168 | 161 b | 20.1 | 23.2 | 21.63 a |
| RP Bio-226 | 3.16 | 3.31 | 3.23 b | 169 | 165 | 167 ab | 18.3 | 18.2 | 18.25 b |
| Mean | 3.54m | 3.73m | | 164m | 165m | | 20.9m | 21.5m | |
| *Kharif* 2016 | | | | | | | | | |
| Rasi | 4.29 | 4.28 | 4.28a | 154 | 175 | 164 c | 19.6 | 17.3 | 18.48 b |
| DRR Dhan 44 | 3.95 | 4.18 | 4.06a | 162 | 175 | 169 c | 25.3 | 27.1 | 26.23 a |
| DRRH-2 | 3.99 | 3.97 | 3.98a | 177 | 173 | 175 bc | 25.9 | 23.2 | 24.55 a |
| HRI 174 | 4.36 | 4.25 | 4.30a | 220 | 194 | 207 a | 25.2 | 26.1 | 25.65 a |
| RNR 15048 | 4.03 | 4.09 | 4.06a | 198 | 175 | 186 abc | 17.0 | 15.7 | 16.38 b |
| Varadhan | 4.16 | 4.20 | 4.18a | 189 | 183 | 186 abc | 25.7 | 25.5 | 25.58 a |
| Sampada | 4.35 | 3.77 | 4.06a | 193 | 172 | 182 abc | 24.1 | 25.8 | 24.95 a |
| Jaya | 4.08 | 4.31 | 4.20a | 196 | 199 | 198 ab | 26.5 | 26.7 | 26.60 a |
| RP Bio-226 | 4.36 | 4.31 | 4.33a | 208 | 196 | 202 a | 16.2 | 15.2 | 15.7 b |
| Mean | 4.17m | 4.15m | | 189m | 183m | | 22.8m | 22.5m | |

a,b,c,d,e,f- In a column, means followed by different letters for particular set of treatments are significantly different at p = 0.05 using Tukey's HSD. m,n-In a row, means followed by different letters for particular set of treatments are significantly different at p = 0.05 using Tukey's HSD.

**Table 4.** Grain yield, straw yield, harvest index and per day productivity of rice as influenced by establishment technique and cultivars.

| | Grain yield (t ha$^{-1}$) | | | Straw yield (t ha$^{-1}$) | | | Harvest index (%) | | | Per-day Production (kg grain ha$^{-1}$day$^{-1}$) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cultivar** | CT | DSR | Mean | CT | DSR | Mean | CT | DSR | Mean | CT | DSR | Mean |
| *Rabi* 2015-16 | | | | | | | | | | | | |
| Rasi | 3.59 | 3.70 | 3.65 e | 4.51 | 4.67 | 4.59 cd | 44.37 | 44.26 | 44.31 a | 31.14 | 33.04 | 32.09 e |
| DRR Dhan 44 | 3.96 | 4.27 | 4.12 c | 4.76 | 5.40 | 5.08 cd | 45.45 | 44.17 | 44.81 a | 33.50 | 37.70 | 35.62 bc |
| DRRH-2 | 4.40 | 4.50 | 4.45 b | 5.55 | 6.72 | 6.14 ab | 44.35 | 40.10 | 42.23 ab | 38.72 | 40.41 | 39.55 a |
| HRI 174 | 4.79 | 4.88 | 4.83 a | 6.51 | 6.85 | 6.68 a | 42.47 | 41.59 | 42.03 ab | 35.81 | 36.96 | 36.38 b |
| RNR 15048 | 4.03 | 4.06 | 4.05 cd | 4.66 | 5.33 | 5.00 cd | 46.38 | 43.28 | 44.83 a | 32.19 | 35.28 | 33.75 de |
| Varadhan | 4.22 | 4.18 | 4.20 c | 5.30 | 6.60 | 5.95 ab | 44.54 | 38.81 | 41.68 ab | 34.23 | 34.48 | 34.35 cd |
| Sampada | 3.90 | 3.86 | 3.88 d | 6.58 | 6.62 | 6.60 ab | 37.27 | 36.90 | 37.08 c | 28.88 | 31.34 | 30.11 f |
| Jaya | 4.21 | 4.14 | 4.17 c | 6.31 | 6.84 | 6.57 ab | 40.00 | 37.72 | 38.86 bc | 31.00 | 33.94 | 32.45 e |
| RP Bio-226 | 3.88 | 3.90 | 3.89 d | 5.12 | 6.44 | 5.78 bc | 43.27 | 37.76 | 40.52 bc | 28.09 | 29.83 | 28.95 f |
| Mean | 4.11m | 4.17m | | 5.48n | 6.16m | | 43.12m | 40.51n | | 32.62n | 34.77m | |
| *Kharif* 2016 | | | | | | | | | | | | |
| Rasi | 3.58 | 3.82 | 3.70 e | 4.37 | 5.00 | 4.69 d | 45.09 | 43.63 | 44.36 ab | 31.19 | 33.41 | 32.3 d |
| DRR Dhan 44 | 4.18 | 4.43 | 4.31 d | 4.83 | 5.20 | 5.01 cd | 46.08 | 46.74 | 46.25 a | 35.35 | 37.79 | 36.57 b |
| DRRH-2 | 4.52 | 4.67 | 4.60 bc | 5.63 | 6.34 | 5.99 abc | 44.69 | 42.54 | 43.62 ab | 39.31 | 40.76 | 40.03 a |
| HRI 174 | 5.36 | 5.11 | 5.23 a | 6.85 | 7.02 | 6.94 ab | 44.15 | 42.17 | 43.16 ab | 40.08 | 39.01 | 39.55 a |
| RNR 15048 | 4.24 | 4.23 | 4.24 d | 4.77 | 5.54 | 5.16 cd | 47.06 | 43.38 | 45.23 ab | 33.86 | 34.38 | 34.13 cd |
| Varadhan | 4.30 | 4.37 | 4.34 cd | 5.44 | 6.51 | 5.97 abc | 44.32 | 40.31 | 42.32 ab | 34.90 | 35.56 | 35.23 bc |
| Sampada | 4.85 | 4.59 | 4.72 b | 7.03 | 6.79 | 6.91 ab | 40.81 | 40.37 | 40.59 b | 35.89 | 35.54 | 35.73 bc |
| Jaya | 5.56 | 5.05 | 5.31 a | 7.63 | 6.57 | 7.10 a | 42.56 | 43.00 | 42.85 ab | 40.31 | 39.24 | 39.77 a |
| RP Bio-226 | 4.59 | 4.55 | 4.58 bc | 5.63 | 6.30 | 5.96 bc | 44.92 | 42.24 | 43.61 ab | 33.38 | 34.07 | 33.75 cd |
| Mean | 4.58m | 4.54m | | 5.80m | 6.14m | | 44.40m | 42.70m | | 36.03m | 36.64m | |

a,b,c,d,e,f- In a column, means followed by different letters for particular set of treatments are significantly different at p = 0.05 using Tukey's HSD. m,n-In a row, means followed by different letters for particular set of treatments are significantly different at p = 0.05 using Tukey's HSD.

Total crop duration was reduced in DSR during both the seasons (Fig. 2). However, Reduction in total duration was more in *rabi* than *kharif*. Medium and late maturing varieties reduced duration more compared to early ones owing to no transplanting shock in DSR method.

## Yield and production efficiency

The crop-establishment methods did not influence grain yield in both seasons (Table 4). Non-significant difference in grain yield of CT and DSR is due to the similar responses of the two methods in terms of panicle weight, grains per panicle and 1000-grain weight. Whereas, the straw yield ranged from 4.51 to 6.85 t ha$^{-1}$ and 4.37 to 7.63 t ha$^{-1}$ during *rabi* and *kharif*, respectively. Significantly higher straw yield during *rabi* may be due to the higher tiller number produced and taller plants in DSR. Grain yields during the *rabi* season were higher by about 1.5% for DSR method, whereas, during *kharif*, it was about 1% higher for transplanted rice. Ali et al. (2006) and Huang et al. (2011) also found no significant difference in grain yield of rice in DSR and conventional transplanting.

During *rabi* 2015-16, grain yield of six cultivars in DSR were higher compared to TPR, excluding Sampada, Jaya and Varadhan. High grain yield advantage (more than 5%) was observed only in DRR Dhan 44 (Fig. 3). Other cultivars performed similarly both in direct seeding and transplanting. Short duration (<125 days) cultivars except Varadhan and hybrids (DRRH-2 and HRI 174) performed very well in DSR during *rabi* may be due to less exposure to high temperature periods (day temperature reached 38°C from April) at the time of grain filling and due to advantage of hybrid-vigour respectively. During *kharif*, cultivars *viz*., Rasi, DRR Dhan 44, DRRH-2 and Varadhan yielded more grain in direct seeding; whereas HRI-174, Sampada and Jaya performed comparatively

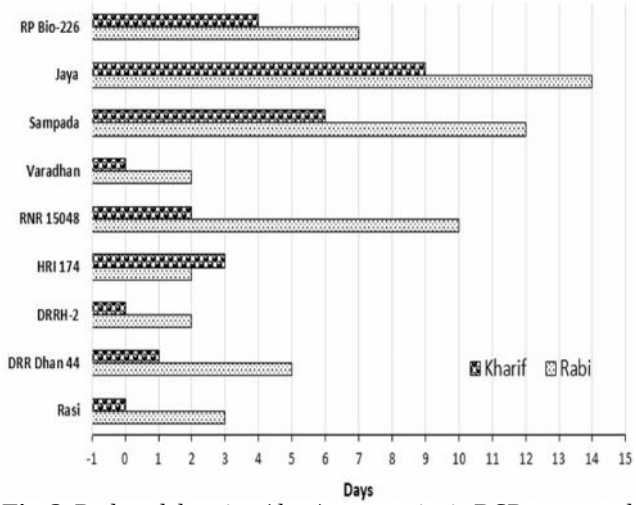


**Fig. 2.** Reduced duration (days) to maturity in DSR compared to transplanting in different cultivars.

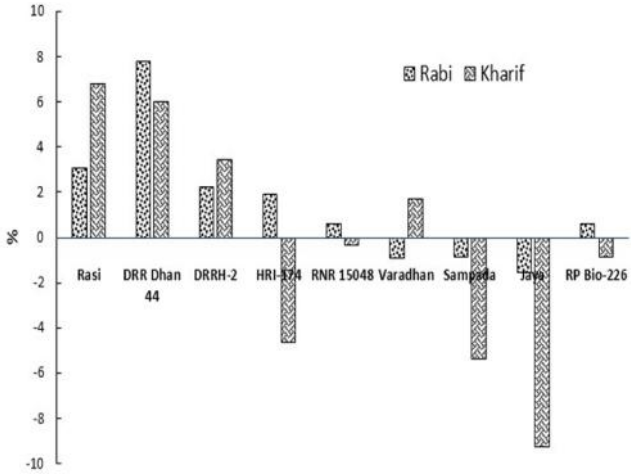


**Fig. 3.** Yield advantage (%) in DSR compared to transplanting in different cultivars.

better in conventional transplanting. The yield difference in two different establishment methods in case of RNR-15048 and RP Bio-226 were less than 1% (Fig. 3). Higher yield advantage was observed in Rasi and DRR Dhan 44 (6.8 and 6%, respectively). Grain yield from the two season's data revealed that few varieties are better in direct seeding compared to conventional transplanting during both the seasons *viz*., DRR Dhan 44, DRRH-2 and Rasi. This is mainly due to higher tillering capacity and/or production of more number of grains per panicleby those cultivars in DSR than transplanting. Yield gain in DSR in *rabi* season may due to absence of transplanting shock in DSR during low temperature period (January). Direct seeding may also hastens overlapping period of the high temperature during maturity phase when grown in *rabi* season. According to Garcia et al. (1995) and Dingkuhn et al. (1991), grain yield of transplanted and wet-seeded rice were comparable when adequately fertilized. However, in some cases wet-direct seeded rice out-yielded conventional transplanted rice (Tabbal et al., 2002).

The efficiency of different establishment techniques was evaluated by harvest index and per-day grain production. Higher straw yield in DSR inversely influenced the harvest index during both the seasons (Table 4). Although, during *rabi* harvest index was higher in CT and per-day grain production was better in DSR among all varieties. This is due to reduced duration to maturity in DSR. However, during *kharif* harvest index as well as per-day grain production did not differ significantly. Rashid et al. (2009) found comparable results of harvest index; although, higher values of per-day production in conventional transplanting when comparing with drum seeding in puddled condition. In their study, only main field duration was considered for calculation of per-day grain production; as a result higher values were obtained in transplanting. Comparing average grain yield of early, hybrids, mid-early, medium and late cultivars, it was found that difference in yield during *rabi* and *kharif* season was more pronounced in case of medium and late varieties. *Rabi* season yield was very less in medium and late cultivars as these cultivars faced higher day temperature (> 35°C) for comparatively longer period during their grain filling; which might act unfavouably (Krishnan and Rao, 2005).

## CONCLUSION

Growth and yield attributing characters *i.e.*, plant height, tiller number $m^{-2}$, panicle weight, grains per panicle and 1000-grain weight were indifferent in direct seeding and transplanting method. During *rabi* season DRR Dhan 44, Rasi, DRRH-2, HRI-174, RNR 15048, RP Bio-226 can be grown in direct seeding; whereas in *kharif* suitable cultivars for direct seeding may be Rasi, DRR Dhan 44, DRRH-2 and Varadhan based on yield advantage with DSR. Even, varieties performed similar with less yield gaps may be considered when other

factors seem to be more convenient for grower's perspective *e.g*., reduce cost of cultivation. Since, choice of variety will vary with grain type, duration, purpose of growing and other factors. However, wide scale screening of rice varieties is essential to evaluate their suitability under wet-direct seeding for irrigated areas for enhancing the productivity and profitability.

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