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Influence of planting windows on growth and yield of rice varieties (*Oryza sativa* L.)

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ABSTRACT

Field experiment was carried out during *kharif* 2016 on sandy clay loamy soils of Agricultural college, farm Bapatla to study the effect of different transplanting dates on growth and yield of different rice varieties. The experiment was laid out in Randomized block design with factorial concept with three rice varieties (V_1= BPT-5204, V_2= NLR-33892, V_3= BPT-2270) and four dates of transplanting (1st fortnight of August, 2nd fortnight of August, 1st fortnight of September, 2nd fortnight of September) and replicated thrice. Results indicated that the crop planted during 1st fortnight of August recorded significantly highest plant height, drymatter, yield attributes, grain yield and straw yield compared to other dates of transplanting. Among the varieties BPT-2270 recorded significantly highest drymatter, yield attributing characters, grain yield and straw yield compared to BPT-5204 and NLR-33892 and these were on par with each other. There was a gradual decrease in plant height, drymatter, yield attributing characters and yield with each delay in planting from 1st fortnight of August to 2nd fortnight of September irrespective of variety.

Key words: *Dates of transplanting, Rice varieties and Yield*

Rice (*Oryza sativa* L.) is one of the most important cereal crops in India, with an area of 43.95 M ha and a production of 104.80 Mt with the average productivity of 2392 kg ha^{-1}. Andhra Pradesh has an area, production and productivity of 3.80 M ha, 11.56 Mt and 2856 kg ha^{-1}, respectively (*http//www.indiaagristat.com*, 2014-15). There is an urgent and imperative need to improve rice productivity to nurture the ever growing population under constraints of climate change and its variability. In addition, the cost of cultivation of rice is increasing alarmingly necessitating to find out non-monetary inputs in its production. Among several agronomic practices, time of planting is an important non-monetary input for realizing higher productivity in rice. In many farming situations, planting time is highly variable due to agronomic, climatic/weather and economic constraints faced by farmers.

Planting of rice in coastal districts of Andhra Pradesh is entirely dependent on release of water in the canal system, which is often delayed and more so in tail-end single-cropped wetland areas. The maximum productivity will be achieved by planting the crop at optimum time, hence the present investigation was carried out to find out the performance of different rice varieties under different planting dates.

MATERIAL AND METHODS

A field experiment was carried out at Agricultural college Farm Bapatla during *kharif* 2016 in Randomized block design with factorial concept with three rice varieties (V_1= BPT-5204, V_2= NLR-33892, V_3= BPT-2270) and four dates of transplanting (D_1=1st fortnight of August, D_2= 2nd fortnight of August, D_3=1st fortnight of September, D_4=2nd fortnight of September) and replicated thrice. The soil of the experimental site was sandy clay in texture, low in organic carbon and available nitrogen, medium in available phosphorus and high in available potassium. Seedlings of 30 days old were transplanted adopting a spacing of 20×15 cm with two seedlings per hill. The crop was supplied with 120: 60: 40 kg ha^{-1} N, P, K respectively. Nitrogen was applied in three equal splits(1/3 as basal, 1/3 at maximum tillering and 1/3 at panicle initiation stage). Phosphorus was supplied through single super phosphate as basal. Potassium was supplied through muriate of potash in two equal

splits (1/2 as basal, 1/2 at panicle initiation stage). Recommended agronomic practices and plant protection measures were followed.

RESULTS AND DISCUSSION

The dates of transplanting and varieties significantly affected the plant height. Rice transplanted in 1st fortnight of August produced significantly taller plants compared to other dates of transplanting followed by 2nd fortnight of August planting and there was a gradual decrease in plant height with each delay in planting at harvest. Among the varieties NLR-33892 produced significantly taller plants compared to other varieties followed by BPT-2270 which is on par with BPT-5204 at harvest. The interaction between dates of transplanting and varieties was non-significant. Increase in plant height in early planting might be due to optimum weather conditions during its entire crop growth period, which might have favored rapid cell division and multiplication resulting in elongation of plants. The present findings are in conformity with those of Verma *et al*. (2008) and Akhilesh vishwakarma *et al.* (2016).

Drymatter production differed significantly due to dates of planting and varieties. The interaction between dates of transplanting and varieties was non-significant (Table 1). Significantly highest drymatter was recorded with the 1st fortnight of August planting followed by 2nd fortnight of August and lowest was observed with the crop transplanted in 2nd fortnight of September and there was a gradual decrease in drymatter accumulation with each delay in transplanting at harvest. Among the varieties, significantly highest drymatter accumulation was recorded with the variety BPT-2270 followed by NLR-33892 which was on par with BPT-5204. Higher drymatter production with early planting could be attributed to the cumulative effect of more plant height, increased tiller production and favorable temperatures. Similar findings were observed by Ravi Kumar *et al.* (1992), Krishnan and Nayak (1997) and Pandey *et al.* (2001)

It is evident from the table 1 that the date of transplanting and varieties significantly affected the tillers m^{-1}, effective tillers m^{-1}, panicles $hill^{-1}$ and number of grains per panicle. Significantly highest tillers m^{-1}, effective tillers m^{-1}, panicles $hill^{-1}$, number of grains per panicle were produced with the 1st fortnight of August transplanting followed by 2nd fortnight of August transplanting and lowest values were recorded with the 2nd fortnight of September planting. There was a gradual decrease in all yield attributes with each delay in transplanting from 1st fortnight of August to 2nd fortnight of September. Dates of planting did not influence the 1000 grain weight. Among the varieties significantly highest tillers m^{-1}, effective tillers m^{-1} delayed days to 50% flowering, delayed days to maturity, panicles $hill^{-1}$, number of grains per panicle were recorded with the variety BPT-2270 followed by NLR-33892 which was on par with BPT-5204. It might be owing to longer growing period of the crop for better development of parts to allocate greater accumulation of photosynthates in early planted which may results in the better development of yield attributes (Akhilesh vishwakarma *et al.,* 2016). Dates of planting did not influence the 1000 grain weight.

Data pertaining to grain yield presented in Table 2 indicated early planting during 1st fortnight of August significantly enhanced the grain and straw yield over other plantings (2nd fortnight of August, 1st fortnight of September, 2nd fortnight of September). The per cent increase in grain yield with 1st fortnight of August over 2nd fortnight of August, 1st fortnight of September and 2nd fortnight of September plantings was in the order of 11.93, 25.34 and 29. The higher grain yield by early planting might be due to the combined effect of higher values for growth character (taller plants and drymatter production) and yield attributing characters like number of productive tillers, number of filled grains per panicle and test weight and also due to favorable weather conditions prevailed during the grain filling and maturity phase of the crop. The reduction of grain yield with late planting could be attributed to shortening of its duration under delayed planting and perceptible reduction of yield attributes. Among the varieties, significantly highest grain and straw yields were recorded with the variety BPT-2270 followed by NLR-33892 which was on par with BPT-5204. This was due to more productive tillers and test weight which resulted in higher grain yield. Straw yield recorded with 1st fortnight of August (D_1) was significantly superior to remaining dates of planting. Among the varieties, BPT-2270 recorded significantly highest straw yield. This might be due to crop had an opportunity of longer growth period with sufficient light, temperature and relative humidity which the variety was able to harness.

Findings of this study are in accordance with those of Gill *et al*. (2006), Ramana *et al*. (2007), Akhilesh vishwakarma *et al.* (2016). Harvest Index (%) was not significantly influenced by dates of planting, varieties and the interaction between dates of planting and varieties.

Table 1. Plant height, Drymatter, Tiller number m^{-2}, Productive tillers m^{-2}, Panicles $hill^{-1}$, Total number of grains $panicle^{-1}$ and Test weight of rice as influenced by dates of transplanting and varieties

Treatments	Plant height at harvest (cm)	Drymatter at harvest (kg ha^{-1})	No. of tillers m^{-2}	No. of productive tillers m^{-2}	Panicles $hill^{-1}$	No. of grains $panicle^{-1}$
Varieties(V)						
BPT-5204 (V_1)	103.01	11673.8	393.7	319.0	14.5	168.8
NLR-33892 (V_2)	153.21	12297.0	412.0	335.9	15.3	171.0
BPT-2270 (V_3)	127.0	14406.7	447.5	379.5	17.5	192.1
SEm±	3.54	368.6	6.82	6.11	0.59	0.86
CD (0.05)	10.4	1081.0	20.0	17.9	1.7	2.5
Dates of Transplanting (D)						
(D_1)1st fortnight of August	145.8	14118.5	446.6	372.3	18.9	176.8
(D_2) 2nd fortnight of August	132.1	12847.6	421.3	349.8	16.5	161.6
(D_3) 1st fortnight of September	119.2	11592.2	397.3	328.1	14.0	146.6
(D_4) 2nd fortnight of September	113.9	11278.3	392.4	321.4	13.7	144.3
SEm±	4.1	425.63	7.8	7.06	0.68	1.00
CD (0.05)	12.0	1248.3	23.1	20.7	2.0	2.9
Interaction (D x V)						
SEm±	4.1	737.21	13.65	12.22	1.18	1.73
CD (0.05)	NS	NS	NS	NS	NS	NS
CV (%)	10.2	10.2	6.5	6.1	13.0	8.6

Table 2. Grain yield (kg ha^{-1}), Straw yield (kg ha^{-1}) and Harvest Index (%) of rice as influenced by dates of transplanting and varieties.

Treatments	Grain yield	Straw yield	Harvest Index
Varities(V)			
BPT-5204 (V_1)	4192.3	5965.0	41.3
NLR-33892 (V_2)	4582.9	6490.0	41.5
BPT-2270 (V_3)	5725.1	7780.0	42.4
SEm±	133.24	183.32	0.53
CD (0.05)	390.8	537.7	NS
Dates of Transplanting (D)			
(D_1)1st fortnight of August	5577.8	7889.1	41.4
(D_2) 2nd fortnight of August	4983.1	6997.9	41.5
(D_3) 1st fortnight of September	4450.0	6129.1	42.0
(D_4) 2nd fortnight of September	4322.8	5964.0	41.9
SEm±	153.86	211.68	0.61
CD (0.05)	451.3	620.9	NS
Interaction (D x V)			
SEm±	266.49	366.65	0.75
CD (0.05)	NS	NS	NS
CV (%)	9.5	9.4	3.1

CONCLUSION

Among the dates of planting the 1st fortnight of August planting recorded the higher values of growth parameters, yield attributes and yield of rice. Among the varieties BPT-2270 recorded highest values of these parameters and its performance was superior to BPT-5204 and NLR-33892. The highest gross returns, net returns and B:C ratio were obtained with variety BPT-2270 when planted on 1st fortnight of August planting.

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