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Performance of rice varieties with types of seedling under late planted lowland situation

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ABSTRACT

A field experiment was conducted under late planted lowland situations during wet seasons of 2012 and 2013 at Jorhat to evaluate the performance of 3 late planted *sali* (*kharif*) rice varieties (Prafulla, Gitesh and Monoharsali) under 3 planting dates (10, 20 and 30 September) with 2 types of seedling (Nursery seedling and double planted seedling). Results revealed that delaying planting dates from 10 September to 30 September significantly and consistently reduced both grain and straw yields along with all the yield attributing characters during both the years. On an average, the grain and straw yield reduction being 58.3 and 19.3 per cent, respectively. Among the varieties tested, rice variety 'Monoharsali' outyielded the variety, 'Prafulla' and 'Gitesh'. Double planted seedlings of 60 days (30 + 30 days) old recorded significantly higher yields and all the yield attributes over the use of 60 days nursery seedling. The highest net return and benefit-cost ratio was recorded when rice variety, 'Monoharsali' was transplanted on 10 September using 60 days (30 + 30 days) double planted seedling.

Key words: Late planted rice, Lowland, Rice variety, Type of seedling.

INTRODUCTION

Late planting of rice in September is a common practice in vast areas of Assam, because of low lying situation, natural calamities like flood etc. In these low lying areas traditional photosensitive long duration varieties with aged seedlings are invariably grown to overcome the problems. Certain HYV/Improved varieties of rice have been found promising at different locations in Assam for delayed planting in September. It was reported by many researchers that double planted seedlings have added advantages over nursery raised seedlings of the same age group (Singh, 1989, Ghosh, 2006, Ashem *et al.*, 2010 and Changmai, 2015). The practice of double transplanting of rice avoids ill effects of overaged seedlings in the nursery and it is also useful in seedling scarcity situations and can cover 8-10 times more area as compared to normal planting with nursery raised seedling. The seedlings obtained from double planting are more robust, tall and easily establish under late planted condition. Hence, a study was undertaken to find out varietal suitability and type of seedling for getting maximum yield under late planted lowland condition.

MATERIALS AND METHODS

A field experiment was carried out at the Instructional-cum-Research Farm of Assam Agricultural University, Jorhat during late wet seasons of 2012 and 2013 in split plot design with 3 replications. The treatments consisted of 3 planting dates (10, 20 and 30 September), were tested in main plots and combinations of 3 rice varieties (Prafulla, Gitesh and Monoharsali) with 2 types of seedling (Nursery raised and double planted seedlings) in sub-plots. The soil of the experimental site was sandy loam with pH 5.2 having 0.54% organic carbon, 245.4 kg/ha available N, 8.9 kg/ha available P and 82.2 kg/ha available K. In both years, all the three varieties were sown in nurseries as per treatment adjusting by age of seedling in both the types at 60 days on the date of transplanting of seedlings. In case of double planted seedlings (DPS), uprooting of seedling was done at 30 DAS from the first nursery and closely planted in the second nursery under puddle condition keeping 10 cm x 10 cm spacing and kept for another 30 days, then uprooting was done. Finally, the 60 days old seedlings were transplanted at 20 x 10 cm spacing with 3 seedlings per hill by separating the tillers in the main field. The depth of water in the experimental field on the first date of planting ie 10 September was 21.7 and 22.6 cm in 2012 and 2013, respectively, thereafter water level gradually recedes and soil saturation condition prevailed after 15 October during both the years. A uniform dose of fertilizers @ 20-10-10 kg N, P_2O_5 and K_2O/ha was applied in the field after second week of October during both the years. Irrespective of treatments, all the varieties were harvested during last week of December in each year. The rainfall received during the crop growing period in 2012 and 2013 was 175.0 and 285.7 mm, respectively.

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RESULTS AND DISCUSSION

Date of planting : Grain and straw yields of rice as well as harvest index decreased significantly and consistently with delay in transplanting dates from 10 September to 30 September during both the years and mean of two years (Table 1). The decrease in grain and straw yield with delaying transplanting dates was accompanied by fewer panicles, filled grains per panicle and low 1000 grain weight (Table 2). On an average, the decrease in grain yield with every 10 days successive delay from 10 September to 30 September was 26.9 and 42.9 per cent. The corresponding decrease in straw yield was 8.9 and 11.4 per cent. On the other hand, the per cent unfilled grains per panicle increased progressively as the planting was delayed from 10 September to 30 September during both the years. Significant reduction of yield was observed at successive delay in planting dates due to less time available for assimilation of photosynthates in grains. Reduction in yield due to delayed planting was also reported by Lakpale *et al.* (1994) and Ghosh (2006).

Variety: Among the three late varieties of rice, 'Monoharsali' produced significantly higher grain and straw yields over the other two varieties (Table 1). On an average, grain yield increase in 'Monoharsali' over 'Prafulla' and 'Gitesh' was 48.1 and 42.6 per cent, respectively. The corresponding straw yield increase was 24.8 and 14.9 per cent. All the yield attributing characters *viz.,* panicles/m^2, filled grains/panicle and 1000 grain weight were also recorded highest with the variety 'Monoharsali'. This might be due to longer panicles, lesser percentage of unfilled grains/panicle and higher 1000 grain weight of 'Monoharsali' compared to 'Prafulla' and 'Gitesh'. The results corroborate the findings of Saikia (2016) who also opined that long duration photosensitive variety, 'Monoharsali' gave better results upto 25 September planting.

Type of seedling : The grain and straw yield increased significantly with the use of 60 days (30 + 30 days) double planted seedling over 60 days old conventional nursery seedling. The increase being 64.7 and 17.6 per cent, respectively. All the yield attributing characters including 1000 grain weight during both years recorded significantly higher values with 60 days old double planted seedling over the use of 60 days old nursery raised seedling. Double planted seedlings had thicker culm, taller height and better shoot and root growth and thereby more food reserves in comparison to conventional nursery raised seedlings (Table 3). This might probably led to quick establishment of seedlings in main field and production of effective tillers which ultimately contributed towards higher grain and straw yields. The grain sterility percentage was significantly lesser when double planted seedling was used as compared to nursery seedling which might be another reason for obtaining higher yield under double planted seedling. Similar results were also reported by Singh and Thakur (1991), Rautaray (2006) and Ashem *et al.* (2010).

Economics : The highest values in terms of net return and benefit-cost ratio were recorded when rice variety, 'Monoharsali' was planted on 10 September with 60 days (30+30 days) old double planted seedlings (Table 1).

Interaction : The interaction effect between variety and date of planting on grain yield was significant (Table 4). Irrespective of varieties, grain yield decreased significantly with delaying the planting dates from 10 September to 30 September. Among different planting dates, 10 September planting recorded the highest grain yield in respect of all the

Table 1: Grain and straw yield (t/ha) of rice, harvest index (%) and economics as influenced by planting dates, varieties and type of seedling

Treatment	Grain yield (t/ha)			Straw yield (t/ha)			Harvest index (%)	Economics (mean of 2 years)	
	2012	2013	Mean	2012	2013	Mean	(mean of 2 years)	Net return (Rs./ha)	Benefit-cost ratio
Date of transplanting									
10 September	2.14	2.89	2.52	6.88	7.01	6.94	26.6	30,570	2.16
20 September	1.73	1.94	1.84	6.26	6.38	6.32	22.5	19,750	1.39
30 September	0.99	1.10	1.05	5.49	5.72	5.60	15.8	7,180	0.51
S.Em(±)	0.021	0.064	0.032	0.123	0.264	0.105	-	-	-
CD (P=0.05)	0.08	0.25	0.13	0.48	1.04	0.41	-	-	-
Variety									
Prafulla	0.96	1.72	1.34	5.16	5.73	5.45	19.7	11,380	0.80
Gitesh	1.41	1.55	1.48	5.76	6.58	6.17	19.3	14,200	1.00
Monoharsali	2.49	2.67	2.58	7.71	6.79	7.25	26.2	31,780	2.24
S.Em(±)	0.049	0.078	0.039	0.136	0.186	0.116	-	-	-
CD (P=0.05)	0.14	0.23	0.12	0.39	0.54	0.34	-	-	-
Type of seedling									
Nursery seedling (60 days)	1.23	1.48	1.36	5.57	5.99	5.78	19.0	12,320	0.89
Double planting (30+30 days)	2.01	2.48	2.24	6.85	6.75	6.80	24.8	25,920	1.79
S.Em(±)	0.040	0.064	0.064	0.111	0.152	0.095	-	-	-
CD (P=0.05)	0.12	0.18	0.18	0.32	0.44	0.27	-	-	-

Table 2: Growth and yield attributes of rice as influenced by planting dates, varieties and type of seedling

Treatment	Plant height (cm)		No. of panicles/m²		Length of panicle (cm)		Filled grains/panicle		% unfilled grains/ panicle		1000 grain weight (g)	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Date of transplanting												
10 September	92.5	104.3	345.1	271.4	24.0	25.1	103.7	151.0	28.8	24.7	23.1	22.5
20 September	86.3	96.2	275.9	231.0	23.7	23.9	97.2	124.5	31.6	31.5	23.0	21.8
30 September	78.5	75.2	192.9	225.7	22.1	22.3	71.2	83.3	39.2	41.3	22.8	21.2
S.Em(±)	0.83	0.75	12.42	4.75	0.25	0.39	1.26	5.08	1.23	0.59	0.12	0.42
CD (P=0.05)	3.3	2.9	48.7	18.6	0.9	1.5	4.9	19.9	4.8	2.3	NS	NS
Variety												
Prafulla	93.5	97.8	232.5	229.6	25.5	26.1	85.7	115.7	49.9	46.4	22.9	21.6
Gitesh	69.3	81.1	268.5	253.6	19.7	20.8	88.5	122.4	28.9	29.5	18.5	18.5
Monoharsali	94.6	96.8	312.9	244.9	24.6	24.5	97.9	120.8	20.9	21.6	27.4	25.4
S.Em(±)	0.67	0.79	10.15	4.28	0.24	0.23	2.96	2.64	1.27	0.80	0.12	0.18
CD (P=0.05)	1.9	2.3	29.3	12.4	0.7	0.7	8.5	NS	3.6	2.3	0.3	0.5
Type of seedling												
Nursery seedling (60 Days)	79.6	86.7	240.2	240.5	22.6	22.9	82.4	106.9	35.7	35.6	22.7	21.4
Double planting (30+30 days)(30+30 days)	91.9	97.1	302.4	244.9	23.9	24.5	99.0	132.4	30.7	29.5	23.3	22.2
S.Em(±)	0.55	0.65	8.28	3.49	0.19	0.19	2.42	2.15	1.04	0.65	0.09	0.15
CD (P=0.05)	1.6	1.8	23.9	NS	0.5	0.6	6.9	6.2	2.9	1.9	0.3	0.4

NS = Non-significant

Table 3: Characterization of seedling quality used for planting in the experiment (mean of 2 years)

Seedling quality	Nursery seedling (60 days)									Double planted seedling (30 + 30 days)								
	10 Sept.			20 Sept.			30 Sept.			10 Sept.			20 Sept.			30 Sept.		
	P	G	M	P	G	M	P	G	M	P	G	M	P	G	M	P	G	M
Length (cm)																		
Shoot	62	45	75	42	50	58	40	27	61	78	80	88	80	78	84	75	68	80
Root	10	11	12	8	11	10	7	5	11	20	19	19	17	17	19	15	16	15
Dry matter (g/seedling or tiller)																		
Shoot	1.30	1.22	1.42	1.21	1.25	1.27	1.0	0.72	1.15	4.17	4.25	5.15	3.67	3.06	3.63	2.71	2.62	2.83
Root	0.22	0.23	0.24	0.20	0.24	0.23	0.18	0.17	0.20	1.61	2.35	2.14	1.13	1.25	1.67	0.71	1.18	1.44
Tillers/hill	-	-	-	-	-	-	-	-	-	9	10	10	8	8	12	7	8	9

P = Prafulla, G = Gitesh, M = Monoharsali

Table 4: Interaction effect of date of transplanting and variety on grain yield (t/ha) of rice (mean of 2 years)

Date of transplanting	Variety		
	Prafulla	Gitesh	Monoharsali
10 September	1.89	2.31	3.36
20 September	1.39	1.38	2.75
30 September	0.65	0.86	1.63
		S.Em(±)	CD (P=0.05
Difference between 2 planting dates at same variety		0.391	0.79
Difference between 2 varieties at same planting date		0.403	0.82

three varieties. However, the variety, 'Monoharsali' produced significantly higher grain yield over the other two varieties. Variety, 'Prafulla' recorded the lowest yield in all the dates of planting.

CONCLUSION

From the above study it could be concluded that planting of rice variety, 'Monoharsali' on 10 September using 60 days (30+30 days) old double planted seedlings produced the highest grain and straw yield with maximum net return and benefit – cost ratio.

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