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Effect of planting dates and nutrient management on double planted late *sali* rice (*Oryza sativa* L.) under lowland situation

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ABSTRACT

A field experiment was carried out in lowland situation at the Instructional-cum-Research Farm of Assam Agricultural University, Jorhat during late rainy (*kharif*) season of 2013 and 2014 to study the performance of double planted late *sali* rice under 3 planting dates (10, 20 and 30 September) along with 3 nutrient management practices followed in second nursery (control, 20-10-10 kg N, P_2O_5, K_2O/ha and FYM @ 2 t/ha) and 2 levels of fertilizers (control and 20-10-10 kg, P_2O_5, K_2O/ha) applied in the main field. Sixty days (30+30 days) old seedlings of double transplanting rice variety, 'Gitesh' was used in the experiment. Experimental results revealed that delaying the planting dates from 10 September to 30 September, the grain and straw yields and almost all the yield attributes decreased significantly and consistently upto 30 September during both the years. On an average, the decrease in grain and straw yield with every 10 days successive delay from 10 September to 30 September was 41.1 and 66.0 per cent and 13.3 and 24.4 per cent, respectively. Nutrient management followed in second nursery either through inorganic or organic source could not significantly influence the yield and yield attributes of rice. Application of fertilizer @ 20-10-10 kg N, P_2O_5, K_2O/ha in main field had not any significant response to grain yield but straw yield increased significantly over the control. The highest net returns were obtained when trans lanting was done on 10 September and fertilizers applied @ 20-10-10 kg N, P_2O_5, K_2O/ha both in second nursery and main field of rice crop.

Key words : Double planting, Lowland, Nutrient management, Planting dates, *Sali* rice.

INTRODUCTION

Out of the total cultivated area of 40.0 lakh ha in Assam, lowland area occupies about 5.8 lakh ha where rice is grown during the late *kharif* season upto the end of September. In this situation, farmers are compelled to go for delayed transplanting with photoperiod sensitive long duration varieties of rice with over-aged seedling. Sometimes, late transplanting is also to be resorted to due to late onset of monsoon in the rainfed areas, high level of accumulated water in low-lying areas or due to other unforeseen reasons. Adverse seasonal conditions and other socio-economic factors often forced the farmers to take up planting late with over-aged seedling. The use of over-aged seedlings and delayed transplanting influence the performance and yield of rice crop. Double transplanting is a method of rice establishment where seedlings are raised first in the nursery for 25 to 30 days followed by transplanting in another nursery at closer spacing (10cm x 10 cm) in puddled field and after another 25 or 30 days tillers from the uprooted hills are separated and finally transplanting is done in the main field. About 8-10 times more area can be covered following this technique as compared to nursery seedling and can eliminate the ill effects of over-aged normal seedling (Rautaray, 2006 and Ashem *et al*., 2010).

Nutrient management in lowland rice ecosystem is not so easy owing to submergence of land upto the end of maximum growth stage of the crop. In this situation, nutrients in the form of either organic or inorganic may be applied in the second nursery for getting healthy and taller seedlings for better crop stand or applied in the main field when water recedes. Considering the above points, the present study was undertaken to find out the effects of various nutrient management practices followed in second nursery and in main field at different planting dates in late double planted rice for getting higher production.

MATERIALS AND METHODS

A field experiment was carried out in lowland at the Instructional-cum-Research Farm of Assam Agricultural University, Jorhat during late *kharif* seasons of 2013 and 2014. The treatments consisted of 3 planting dates (10, 20 and 30 September) allocated in main plots and combinations of 3 nutrient management practices adopted in second nursery (control, 20-10-10 kg N, P_2O_5, K_2O/ha and FYM @ 2 t/ha) along with 2 levels of fertilizer applied in main field (control and 20-10-10 kg N, P_2O_5, K_2O/ha) in sub-plots in a split plot design with 3 replications. The soil of the experimental field was sandy-loam, having organic carbon 0.54 per cent and available N, P and K of 260.2, 9.2 and

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95.4 kg/ha, respectively with pH 5.0. During both the years, double planted rice seedlings of 60 days old (30+30 days) were kept ready as per planting dates by adjusting the sowing dates in the first nursery and subsequently in second nursery by uprooting 30 days old seedlings from the first nursery and transplanting those at closer spacing of 10 x 10 cm in puddled field in second nursery. Ultimately the double planted seedlings of 60 days old rice variety 'Gitesh' were transplanted in the main field as per treatment. The water depth in the experimental field on the date of first transplanting was 22.7 and 24.6 cm during 2013 and 2014, respectively. The field became saturated condition after 18 October in both the years. The fertilizer dose @ 20-10-10 kg N, P_2O_5, K_2O/ha and FYM @ 2 t/ha were applied as basal in the second nursery as per treatment. In main field again a fertilizer dose of 20-10-10 kg N, P_2O_5, K_2O/ha as per treatment was top dressed in the third week of October in each year when water recedes from the field. Irrespective of transplanting dates the crop was harvested in the last week of December. The rainfall received during the growing period of crop in 2013 and 2014 was 188.4 and 290.2 mm, respe ctively.

RESULTS AND DISCUSSION

Date of planting: Different dates of planting significantly influenced all the growth, yield attributes and yield of rice (Table 2 and 3). Delaying the transplanting dates from 10 September to 30 September the grain and straw yields as well as harvest index decreased significantly and consistently upto 30 September (Table 3). The decrease in grain and straw yield was associated due to decrease in all the yield attributing characters *viz.*, panicles/m^2, filled grains/ panicle and 1000 grain weight (Table 2). On an average, the decrease in grain

Table 1: Seedling quality of rice variety 'Gitesh' used for double transplanting in different dates with nutrient management.

Seedling quality	Year	10 September			20 September			30 September		
		Control	20-10-10 kg N,P_2O_5, K_2O/ha	FYM @ 2 t/ha	Control	20-10-10 kg N,P_2O_5, K_2O/ha	FYM @ 2 t/ha	Control	20-10-10 kg N,P_2O_5, K_2O/ha	FYM @ 2 t/ha
Length (cm)										
Shoot	2013	64.5	67.6	66.3	53.8	60.4	59.0	52.8	56.6	58.8
	2014	73.6	80.4	75.4	61.2	68.6	60.8	58.2	58.2	53.6
Root	2013	20.8	24.0	26.0	16.0	21.5	18.3	12.4	15.5	16.6
	2014	22.2	28.2	23.4	19.6	22.2	17.4	14.4	16.4	16.8
Dry matter (g/tiller)										
Shoot	2013	1.56	2.06	1.82	1.40	1.54	1.49	1.09	1.18	1.20
	2014	1.62	1.91	1.90	1.55	1.64	1.60	1.20	1.25	1.35
Root	2013	0.75	1.27	1.07	0.67	0.76	0.69	0.52	0.53	0.54
	2014	1.03	1.28	0.89	0.74	0.75	0.73	0.59	0.64	0.60
Tillers/hill	2013	8.5	9.4	8.8	8.2	9.0	8.4	7.2	8.4	8.0
	2014	8.8	10.2	10.0	8.0	9.2	9.0	7.6	8.2	8.0

Table 2: Growth and yield attributes of double transplanted rice as influenced by date of planting and nutrient management.

Treatment	Plant height (cm)		Panicles/m^2		Length of pamicle (cm)		Filled grains/panicle		1000 grain weight (g)	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
Date of transplanting										
10 September	84.8	94.4	479.9	281.4	21.5	21.8	139.3	146.6	19.6	19.7
20 September	76.9	83.3	409.6	246.8	20.9	21.1	115.3	115.5	18.9	18.7
30 September	62.2	70.2	278.5	217.9	18.6	20.4	63.6	59.3	16.7	16.1
S.Em(±)	1.41	1.07	9.846	4.59	0.28	0.14	2.94	2.04	0.15	0.06
CD(P=0.05)	5.5	4.2	38.6	18.0	1.1	0.5	11.5	8.0	0.6	0.2
Nutrient in second nursery										
Control	73.2	81.2	400.3	242.7	20.0	20.9	103.0	103.1	18.4	18.3
20-10-10 kg N, P_2O_5, K_2O/ha	74.8	82.8	380.7	252.9	20.4	21.1	107.8	106.0	18.5	18.2
FYM @ 2t/ha	75.9	83.8	386.9	250.5	20.6	21.3	107.3	112.3	18.4	18.1
S.Em(±)	1.09	0.80	9.91	4.44	0.19	0.14	1.85	2.04	0.13	0.13
CD(P=0.05)	NS	NS	NS	NS	NS	NS	NS	5.9	NS	NS
Fertilizer in main field (N, P_2O_5, K_2O kg/ha)										
Control	109.6	82.2	387.9	243.8	20.2	21.0	105.7	108.5	18.3	18.1
20-10-10	114.3	83.0	390.7	253.6	20.5	21.1	106.4	105.8	18.5	18.2
S.Em(±)	0.89	0.65	8.09	3.61	0.15	0.11	1.51	1.66	0.10	0.10
CD(P=0.05)	2.6	NS	NS	NS	NS	NS	NS	NS	NS	NS

NS = Non-significant

yield with every 10 days successive delay from 10 September upto 30 September was 41.1 and 66.0 per cent. The corresponding decrease in straw yield was 13.3 and 24.4 per cent. The harvest index value as well as net return and benefit-cost ratio also decreased with delay in transplanting dates and lowest value was recorded on 30 September. Reduction in yield in delayed planting might be attributed to the effect of low temperature which affected the growth phases of crops and lesser assimilation of photosynthates in grains. The quality of seedlings in respect of growth and dry matter production used in earlier planting dates was better than the later dates which may be another reason for low yield (Table 1). Similar results were also reported by Choudhary *et al.* (1994), Singh (1989), Patel (1999), Ghosh (2006) and Saikia (2016).

Nutrient in second nursery: Application of nutrients in the form of chemical fertilizers or FYM in second nursery could not bring about any significant response in grain and straw yields and almost all the growth and yield attributes during both the years (Table 2 and 3). However, application of fertilizers @ 20-10-10 kg N, P_2O_5, K_2O/ha or FYM @ 2 t/ha recorded higher values over the control. The growth of the seedlings were also better in respect of length of shoot and root as well as dry matter and tiller production per hill in both the nutrient management practices over the control (Table 1) which may be one of the reason for obtaining higher values in all the characters studied. On an average, the increase in grain yield due to application of 20-10-10 kg N, P_2O_5, K_2O/ha or FYM @ 2 t/ha in second nursery over the control was 6.0 and 3.7 per cent. The corresponding increase in straw yield was 2.8 and 3.4 per cent. The highest harvest index value and net returns were recorded with the application of 20-10-10 kg N, P_2O_5, K_2O/ha in second nursery. Singh (2001) also reported that application of urea or FYM at 60 kg N/ha in nursery bed produced healthy seedlings and higher grain yield of rice.

Fertilizers in main field: Application of fertilizers @ 20-10-10 kg N, P_2O_5, K_2O/ha in main field when water recedes from the field which consides at boot stage of the crop, increased the grain and straw yields and all the growth and

Table 3: Grain and straw yield, harvest index and economics of double transplanted rice as influenced by date of planting and nutrient management.

Treatment	Grain yield (t/ha)			Straw yield (t/ha)			Harvest index (%)	Economics (mean of 2 years)	
	2013	2014	Mean	2013	2014	Mean	(mean of 2 years)	Net return (Rs./ha)	Benefit-cost ratio
Date of transplanting									
10 September	2.76	2.65	2.70	7.86	7.35	7.60	26.3	35,857	2.89
20 September	1.56	1.62	1.59	6.44	6.73	6.59	19.4	18,047	1.46
30 September	0.65	0.42	0.54	4.29	5.68	4.98	9.8	687	0.06
S.Em(±)	0.036	0.072	0.054	0.214	0.148	0.119	-	-	-
CD (P=0.05)	0.10	0.28	0.21	0.84	0.58	0.47	-	-	-
Nutrient in second nursery									
Control	1.62	1.49	1.56	6.01	6.51	6.26	19.9	18,300	1.61
20-10-10 kg N, P_2O_5, K_2O/ha	1.74	1.58	1.66	6.27	6.61	6.44	20.5	18,980	1.54
FYM @ 2 t/ha	1.62	1.62	1.62	6.32	6.64	6.48	20.0	17,320	1.29
S.Em(±)	0.043	0.041	0.031	0.138	1.817	0.111	-	-	-
CD (P=0.05)	NS	NS	NS	NS	NS	NS	-	-	-
Fertilizer in main field (N, P_2O_5, K_2O/ha)									
Control	1.59	1.55	1.57	5.77	6.32	6.04	20.6	17,697	1.49
20-10-10	1.73	1.57	1.65	6.62	6.86	6.74	19.7	18,597	1.44
S.Em(±)	0.035	0.033	0.025	0.112	0.148	0.090	-	-	-
CD (P=0.05)	0.10	NS	NS	0.32	0.43	0.26	-	-	-

NS = Non-significant

Table 4: Interaction between date of transplanting and fertilizer level applied in main field on grain yield of double planted rice (mean of 2 years).

Date of transplanting	Fertilizer applied in main field	
	Control	20-10-10 kg N, P_2O_5, K_2O/ha
10 September	2.56	2.80
20 September	1.58	1.61
30 September	0.57	0.51
	S.Em(±)	CD (P=0.05)
Difference between two dates of planting mean at same fertilizer level	0.087	0.25
Difference between two fertilizer levels mean at same planting date	0.075	0.22

yield attributing characters over the control. However, the effect was significant only in case of grain yield in 2013 and straw yield during both years and when averaged over two years. The average increase in grain and straw yield due to application of fertilizers over control was 4.8 and 10.4 per cent, respectively. The net return also recorded higher in fertilizer applied plots over no application. The higher grain and straw yields obtained in fertilizer applied plots might be due to availability of plant nutrients at latter growth stages of rice crop. Similar dose of N, P_2O_5, and K_2O for tall late transplanted *sali* rice varieties has been recommended for Assam (Anonymous., 2009). The average increase in grain and straw yield due to the application of fertilizers in main field over the control was 4.8 and 10.4 per cent, respectively. The beneficial effects of application of fertilizers have been reported by Jee and Mohapatra (1990).

Interaction: Interaction between date of transplanting and fertilizer level applied in main field on average grain yield was significant (Table 4). Irrespective of planting dates, the higher grain yield was recorded with the application of fertilizer dose @ 20-10-10 kg N, P_2O_5, K_2O/ha over the control. However, the effect was significant only on 10 September planting date. Both the fertilizer levels, the grain yield decreased significantly with delay in planting dates from 10 September to 30 September.

CONCLUSION

Overall, it can be concluded that in lowland ecosystem transplanting of double planted rice upto 1st fortnight of September with application of fertilizer @ 20-10-10 kg N, P_2O_5, K_2O/ha in second nursery as well as in main field when water recedes had advantage for higher production and economic returns.

REFERENCES

Anonymous, (2009). Package of Practices for *kharif* Crops of Assam. Prepared jointly by Assam Agricultural University and Department of Agriculture, Assam.

Ashem, S.S., Thakuria, K. and Kurmi, K. (2010). Double transplanting of late transplanted *Sali* rice under lowland situation. *Oryza*. **47**:328-330.

Choudhary, J. K., Kurmi K., Baruah, R. K. S. M. and Das, G. R. (1994). Performance of lowland transplanted *sali* (winter) rice varieties under late planting in Assam, India. *International Rice Res. Notes* **19**(3): 20.

Ghosh, A. (2006). Stand establishment of transplanted rice with different types of seedling into receding water depth under post-flood situation. *Indian Farming*. **56**: 7-9.

Jee, R. C. and Mohapatra, A. K. (1990). Fertilizer management for lowland direct seeded rice. *Oryza*. **27**: 346-347.

Patel, J. R. (1999). Response of rice to time of transplanting, spacing and age of seedlings. *Indian J. Agron.* **44**: 344-346.

Rautaray, S. K. (2006). Yield and economics of promising rice hybrids under double transplanting in late spring summer (boro) situation. *Indian J. Agric. Sci*. **76**: 469-471.

Saikia, R. (2016). Evaluation of different contingency plans for delayed *sali* rice cultivation. Ph.D. thesis submitted to Assam Agricultural University, Jorhat.

Singh, B. K. (1989). Performance of double transplanted photoperiod sensitive rice varieties under delayed transplanting. *Annals Agric. Res.* **10**: 102-104.

Singh, S. K.(2001). Effect of nursery fertilization on seedling growth and grain yield of rainfed lowland rice. *Oryza*. **38**: 156-157.