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Performance of unpuddled rice under late receipt of water in Periyar Vaigai Command (PVC) area

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Abstract
A field experiment was conducted at Central Farm, Agricultural College and Research Institute, Madurai, Tamil Nadu to study the performance of unpuddled rice under late receipt of water for contingent rice plan of *kharif* season in Periyar Vaigai Command. The study was evaluated in Split plot design with three replications and treatment consisting of two date of sowing (July first and second fortnight) assigned in main plots and three varieties viz., ADT 48, MDU 5 and CO 51 under two method of planting (Direct seeded Rice (DSR) and UnPuddled Transplanted rice (UPTR) in sub plots. The observation on growth parameters, yield and yield attributes were recorded and statistically analyzed. The variety CO 51 was raised under direct seeded condition was recorded the higher growth attributes, yield and yield attributes which was on par with unpuddled transplanting of CO 51 rice variety. The lower yield was obtained from unpuddled transplanting of ADT 48. Hence, the results revealed that rice variety CO 51 either sown or transplanted under unpuddled condition on first fortnight of July is the promising option for obtaining higher yield followed by MDU 5 rice variety.

Keywords: DSR, UPTR, dates of sowing, varieties, contingent plan, unpuddled rice

Introduction

"Rice is Life" for most of the people in Asian countries which feeds more than half of the people in the world. Due to increased population, there is a need to increase rice productivity in order to meet the demand of increasing population in the future. In Tamil Nadu, rice is grown in an area of 2.04 million hectare with total production of 9.98 million tonnes (DES, 2016). In Tamil Nadu, rice is cultivated as a major food crop both in first and second season. The traditional practice is raising short duration rice variety in first crop season followed by a medium duration in second crop season. Both sowing and harvest of rice crop depends on monsoon rains. If first crop sowing is delayed due to labour scarcity, harvest of the crop get affected mainly by heavy showers during October month and monsoon aberration also affects the overall production of rice in command/delta area. In Madurai district, Periyar dam is the major source for irrigation water. Normally water is released for irrigation from periyar dam in first week of June to raise first crop followed by second crop in September - October. Frequent monsoon failure especially south west monsoon (SWM), the water release for first crop is delayed even up to August. This shows that some of the *Kharif* area has been shifted to *Rabi* mainly due to consequent of late receipt of canal water. If this situation continues, it is feared that *Kharif* crop would completely vanish and affects food security of PVC area.

Rice is primarily grown by seedling transplantation in puddled field which is very cumbersome and labour intensive as it requires 30 man days ha^{-1} (Gill *et al*., 2006) [6]. Puddling takes upto 30% of total irrigation water in light textured soils (Aslam *et al*., 2002) [2]. Presently, the underground water is being over exploited by excessive pumping to meet the water need of transplanted rice. As a consequence, it results in sharp decline in water table. It is an imperative to identify the alternative methods of rice cultivation to overcome these constraints.

Direct sowing and unpuddled transplanting methods are the new development in water saving techniques, where rice is grown like other cereal crop with supplemental irrigation. Also the availability of very early, early and short duration varieties of rice may suit for the delayed sowing especially during first season. It can be fitted well in delta or canal irrigated regions to catch the second season. Keeping this in view, the present investigation was carried out to identify the promising cultivars with method of planting according to the release of water for enhancing rice productivity under *kharif* season to catch out the second season crop.

Materials and Methods

Field experiment was conducted at Agricultural College and Research Institute, Madurai, Tamil Nadu during *Kharif* season of 2017. The experiment field was sandy loam in texture, low in available N (214 kg ha^{-1}), medium in P (21 kg ha^{-1}) and high in K (293 kg ha^{-1}). The treatment was comprised of twelve treatment combinations viz., two date of sowing (first and second fortnight of July) assigned in main plots and two method of planting with three varieties (Direct seeded Rice (DSR) and Un Puddled transplanted Rice (UPTR) with CO 51, MDU 5 and ADT 48) were in sub plots. The rice varieties CO 51, MDU 5 and ADT 48 have the duration of 115, 100 and 95 days respectively. The experiment was laid out in split plot design with three replications. The field was thoroughly prepared and leveled. The seeds were soaked in water for 12 hrs and incubated for 10 hrs. Sprouted seeds were line sown with a spacing of 20 x10 cm and (seedlings were already raised in community nursery) eighteen days old seedlings were transplanted with same spacing in a saturated soil on the same day (July first and second fortnight). Gap filling and thinning operations were done on 15 DAS and 10 DAT to maintain the optimum plant population. Soil application of Pre-emergence herbicide Pendimethalin 3.3 l ha^{-1} was mixed with 50 kg of sand and broadcasted on 3 DAS and hand weeding was also carried out to manage weeds at later stages. The recommended fertilizer dose of 150:50:50 kg of N, P_2O_5, and K_2O ha^{-1} was adopted in the form of Urea, SSP and MOP. The entire dose of P was applied as basal, N and K was supplemented with four equal split doses at 15 DAS, Active Tillering, Panicle Initiation and flowering stage for direct sowing and in UPTR the split doses of N and K was applied at 7-10 DAT, Active Tillering, Panicle Initiation and flowering stage. Irrigation was provided immediately after sowing to hasten the germination and establishment. Subsequent irrigations were given to maintain moist condition and need based plant protection was given. The observation on growth parameters, yield and yield attributes were recorded and statistically analyzed at 5 % level of significance (Gomez and Gomez, 1984) [7].

Results and Discussion

Effect of dates of sowing

Growth parameters (Table 1)

The data on dates of sowing resulted non-significant differences with respect to growth parameters of plant height (cm), LAI, dry matter production (kg ha^{-1}) and tiller production per unit area (primary, secondary, tertiary and total number of tillers per unit area) at flowering stage. However, the taller plant (85. 1 cm), higher LAI (4.87), more dry matter accumulation and higher number of total tillers (813.6 tillers m^{-2}) was observed in rice cultivated on first fortnight of July than second fortnight of July. However, short period between sowing dates of different varieties under these conditions was enough to deviate all these yield attributes up to significant extent. Better the plant growth character which resulted in effective photosynthetic process thereby increased accumulation of photosynthates for their translocation towards reproductive parts. These results were in accordance with the findings of Walia *et al*. 2014 [12].

Yield attributes and yield (Table 2)

With respect to yield attributes and yield, the dates of sowing had the significant effect upon panicle length (cm), panicle weight (g), number of panicles per unit area, grain yield (kg ha^{-1}) and straw yield (kg ha^{-1}) at harvest. The productivity parameters were found exactly in accordance with the growth and yield attributing parameters under these sowing dates. While, the more number panicles per unit area (402.8 panicles m^{-2}), maximum panicle length (21.3 cm) and panicle weight (1.80 g), and higher grain yield (5136 kg ha^{-1}) was obtained in rice varieties sown on first fortnight of July (D_1) than second fortnight of July (D_2). Ningaraju *et al*. (2015) found that the rice variety sown on July 20 was optimum for obtaining higher grain yield under unpuddled condition.

Response of method of planting with different varieties

Growth parameters (Table 1)

The method of planting with three varieties had considerable variation in growth and yield performance under DSR/UPTR condition. Experimental results revealed that direct sowing of CO 51 rice recorded significantly taller plants (94.1 cm) at flowering stage and which was on par with UPTR of CO 51. The shorter plant of 74.6 cm was observed in ADT 48 under UPTR and it was on par with direct sowing of ADT 48 (77.3 cm). The variation in plant height among the genotypes might be due to difference in their vegetative growth period. The CO 51 rice variety have prolonged vegetative period than the MDU 5 and ADT 48 rice varieties. These results are in conformity with those of Praveen *et al*. (2013) [10]. The significant difference in LAI was observed at flowering stage, direct sowing of CO 51 registered higher LAI (5.43) and it was on par with CO 51 under UPTR (5.05). The least LAI was observed in UPTR of ADT 48 (4.05) and it was on par with DSR with ADT 48.

The primary, secondary and tertiary tillers per unit area were depicted in Fig1. The high number of primary, secondary and tertiary (364.6, 441.2 and 113.9 tillers m^{-2}) and total tillers (927.7 tillers m^{-2}) were produced when CO 51 rice was raised under direct sowing, however, it was on par with the same variety was raised under UPTR. The ADT 48 under UPTR condition was produced less number of primary, secondary and tertiary tillers per unit area of 281.7, 347.4 and 77.9 respectively and it was on par with ADT 48 of direct seeded condition. The total number of tillers per unit area in direct seeded and UPTR of ADT 48 was 737.8 and 705.8. According to Yoshida (1981) [13], the secondary tillers production was always higher than primary tillers, which was clearly indicated in fig 1. When, higher temperature in association with low light intensity, some tiller buds might not develop into tillers due to non-availability of adequate carbohydrates required for growth which restricted the vegetative phase causing less tiller production. The difference in number of tillers m^{-2} among the varieties grown under aerobic culture was also reported by Reddy *et al*. (2012) [11] who evidently stated that, the number of tillers m^{-2} was produced faster rate at active tillering to flowering stage.

Yield attributes and yield (Table 2)

The apparent of data recorded from the yield attributes, the number of panicles per unit area, panicle length and weight, grain yield and straw yield was significantly influenced by method of planting with different rice varieties.

As regard to number of panicles m^{-2}, direct sowing of CO 51 registered higher number of panicles (497 panicles m^{-2}) and it was significantly superior to other varieties. The lesser number (298.5 panicles m^{-2}) of panicles per unit area was recorded in ADT 48 under UPTR method, which similar to ADT 48 under direct seeded condition. The number of panicles m^{-2} at harvest is a vital determinant factor of grain yield in rice. With respect to panicle length and panicle

weight, direct sowing of CO 51 had the highest values of 21.5 cm and 2.27 g and it was at par with UPTR of CO 51.The lowest values (19.1 cm and 1.28 g) were recorded in ADT 48 under UPTR, this was statistically similar to the same variety raised under direct sowing condition. The panicle length is basically governed by genetic feature of a variety. However, it would be affected with the environmental conditions prevailed during the crop growth period. The CO 51 rice variety had longer panicle followed by MDU 5 and ADT 48 varieties as their relative advantage in utilization of growth resources. This genotypic difference among the varieties grown under aerobic condition was reported by Dawadi and Chaudhary (2013) [5].

Rice yield is a function of interplay of various yield components such as number of panicles m^{-2}, panicle length and panicle weight. All the above attributes are under influence of biotic and abiotic factors (Soil moisture, temperature, relative humidity, rainfall, rainy days, solar radiation and day length) which play a major role in deciding the yield of rice crop. Direct sowing of CO 51 was produced the highest grain and straw yield of 5987 kg ha^{-1} and 10341 kg ha^{-1} respectively. The higher grain yield was might be due to synchronization of tiller production per unit area, which helps in early emergence of panicles and more number of panicles per unit area. Basavaraj (2010) [4] found the similar result on grain yield. The next best variety was direct sowing of MDU 5 which produced 5228 kg ha^{-1} and 9281 kg ha^{-1} of grain and straw yield respectively. The lesser grain and straw yield was obtained from UPTR of ADT 48. These values were 4083 and 7053 kg ha^{-1} respectively. However, too short growth duration may not produce high yields because of limited vegetative growth where time for tiller production is less. The lower grain yield in short duration varieties was also reported by Gopal (2008) [8]. Bari (2004) [3] also found significantly higher grain yield from direct wet seeded line planting than other methods. Gill *et al*, (2006) [6] said that grain yield was higher under direct sowing than the transplanted rice due to more dry matter production, Leaf area index and productive tillers per unit area. However, the interaction effect between the dates of sowing and method of planting with different varieties was found to be non-significant

Table 1: Dates of sowing and method of planting on growth parameters of rice at flowering stage

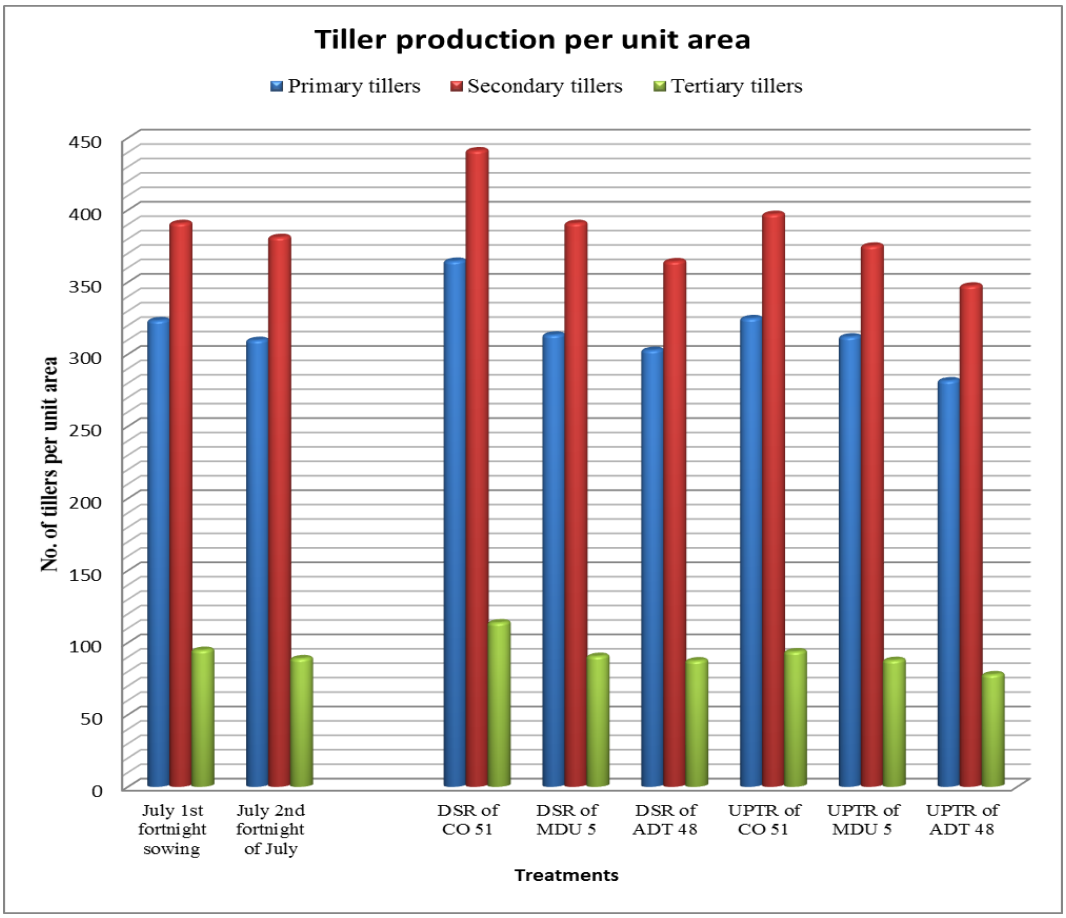
Treatments	Plant height (cm) at flowering	LAI at flowering	Primary tillers (No. m^{-2})	Secondary tillers (No. m^{-2})	Tertiary tillers (No. m^{-2})	Total tillers (No. m^{-2})
Main plot : Dates of sowing						
D_1 – July 1st FN	85.1	4.87	323.4	390.8	94.8	813.6
D_2 – July 2nd FN	81.6	4.64	309.7	381.1	89.0	778.3
Mean	83.3	4.76	316.6	386.0	91.9	795.9
SEd	1.57	0.14	6.56	15.8	1.73	14.9
CD (p=0.05)	NS	NS	NS	NS	NS	NS
Sub plot : Method of planting with different varieties						
T_1 – DSR of CO 51	94.7	5.43	364.6	441.2	113.9	927.7
T_2 – DSR of MDU 5	85.6	4.85	313.4	390.8	90.6	798.1
T_3 – DSR of ADT 48	77.3	4.51	302.8	364.3	87.5	737.8
T_4 – UPTR of CO 51	88.3	5.05	324.8	397.1	93.8	824.6
T_5 – UPTR of MDU 5	79.3	4.61	312.1	375.1	87.8	781.6
T_6 – UPTR of ADT 48	74.6	4.05	281.7	347.4	77.9	705.8
Mean	83.3	4.76	316.6	386.0	91.9	795.9
SEd	3.48	0.25	15.6	17.7	4.76	35.7
CD (p=0.05)	6.74	0.50	31.4	35.6	9.60	72.0

(Interaction effect was not significant)
* FN – Fortnight
* DSR – Direct Seeded Rice
* UPTR – UnPuddled Transplanted Rice
* NS – Non Significant

Table 2: Dates of sowing and method of planting on yield attributes and yield of rice

Treatments	Panicle length (cm)	Panicle weight (g)	Panicles m^{-2}	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})
Main plot : Dates of sowing					
D_1 – July 1st FN	21.3	1.80	402.8	5136	8984
D_2 – July 2nd FN	19.1	1.55	357.9	4891	8458
Mean	20.2	1.67	380.4	5013	8721
SEd	4.30	0.05	8.06	54.7	112.4
CD (p=0.05)	6.23	0.21	34.7	235.6	705.7
Sub plot : Method of planting/sowing with different varieties					
T_1 – DSR with CO 51	21.5	2.27	497.0	5987	10341
T_2 – DSR with MDU 5	20.4	1.96	392.2	5228	9281
T_3 – DSR with ADT 48	19.5	1.40	323.9	4443	7684
T_4 – UPTR of CO 51	20.7	1.70	430.5	5413	9454
T_5 – UPTR of MDU 5	19.9	1.45	340.0	4925	8513
T_6 – UPTR of ADT 48	19.1	1.28	298.5	4083	7053
Mean	20.2	1.67	380.4	5013	8721
SEd	0.73	0.09	19.8	173.9	350.2
CD (p=0.05)	1.47	0.19	39.9	350.3	705.7

(Interaction effect was not significant)
* FN – Fortnight
* DSR – Direct Seeded Rice
* UPTR – Un Puddled Transplanted Rice
* NS – Non Significant



Conclusion

From the results revealed that, if water released from the reservoir delay beyond first fortnight of July, direct seeding of CO 51 rice under unpuddled condition was the optimum for getting high yield and for the follow up crop of second season. Even though, extra early rice variety (ADT 48) tried under direct seeded condition, because of the lesser vegetative period but the yield potential of rice variety was reduced. Hence, the study clearly indicated that the rice variety Co 51 either sown or transplanted on first fortnight of July is the promising option for getting maximum yield under late receipt of water, followed by MDU 5 rice variety.

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References

1. Agricultural statistics at a glance Directorate of Economics & Statistics, DAC&FW Government of India, Ministry of Agriculture & Farmers welfare, New Delhi, 2016.
2. Aslam M, Qureshi AS, Horinkova VM. Water saving strategies for irrigated rice. J Drain Water Manage. 2002; 6:25-36.
3. Bari SMW. Effect of method of planting and weeding on the yield and yield contributing characters of Aman rice cv. BRRI dhan 32. Journal of Bioscience and Agriculture Research. 2004; 4(1):1-7.
4. Basavaraj MK, Murali K, Siddaram, Ramesha YM, Yogeeshappa H. Effect of spacing and genotypes on growth and yield of aerobic rice. International Journal of Agricultural Science Research. 2010; 6:485-487
5. Dawadi KP, Chaudhary NK. Effect of sowing dates and varieties on yield and yield attributes of direct seeded rice in Chitwan, Nepal. International Journal of Agricultural Science Research. 2013; 2(4):95-102.
6. Gill MS, Ashwani Kumar, Pradeep Kumar. Growth and yield of rice cultivars under various methods and times of sowing. Indian Journal of Agronomy. 2006; 51(2):123-127.
7. Gomez KA, Gomez AA. Statistical procedures for Agricultural Research. 2nd Ed John Wiley and Sons, New York. 1984, 680.
8. Gopal R. Zero tillage rice establishment and crop weed dynamics in rice and wheat cropping systems in India and Australia Project Annual Report, 2008, 27.
9. Ningaraju GK, Ramachandra N, Shivakumar M, Rajanna P, Krishnamurthy R. Studies on response of varieties and different dates of sowing on productivity of aerobic rice. J Rice Res. 2015; 3:142
10. Praveen KV, Patel SR, Choudhary JL, Bhelawe S. Heat Unit Requirement of Different Rice Varieties under Chhattisgarh Plain Zones of India. J Earth Sci. Clim. Change an open access journal. 2013; 5(1)
11. Reddy MM, Padmaja B, Veeranna G, Vishnu Vardhan, Reddy D. Evaluation of popular kharif rice (Oryza sativa L.) varieties under aerobic condition and their response to nitrogen dose. J Res. ANGRAU. 2012; 40(4):14-19.
12. Walia US, Walia SS, Sindhu, Nayyar S. Production of direct-seeded rice in relation to different dates of sowing and varieties in central Punjab. Journal of crop weed. 2014; 10(1):126-129.
13. Yoshida S. Fundamentals of rice crop science by the International Rice Research Institute, Los Banos Philippines 1981, 87-90.