ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 8, Issue, 05, pp.30143-30146, May, 2016

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

TILLERING BEHAVIOUR AND YIELD OF DIFFERENT DURATION RICE VARIETIES UNDER DIFFERENT DATES OF SOWING UNDER AEROBIC CULTURE

***BalajiNaik, B., Sreenivas, G., Raji Reddy,D. and Leela Rani, P.**

Agro Climate Research Centre, Rajendranagar, Hyderabad, Prof. Jayasankar Telangana State Agricultural University, Telangana

ARTICLE INFO

Article History:
Received 06th February, 2016
Received in revised form
29th March, 2016
Accepted 22nd April, 2016
Published online 10th May, 2016

Key words:

Aerobic rice,
Varieties,
Dates of sowing,
Tillering behaviour
Yield.

ABSTRACT

A field experiment was conducted at Agriculture Research Station, Madhira for two consecutive seasons of *kharif*, 2012 and 2013 on clay soils to study the effect of different sowing dates on tillering behavior, growth and yield of rice varieties under aerobic culture. The results indicated that, the crop sown early i.e on 18 June produced more number of total and effective tillers, grain and straw yields and decreases with every successive 15 days delay in sowing from 7 July to 18 August during both the years. Among the cultivars medium and long duration cultivars viz., JGL 11470 and MTU 1061 took more number of days to reach maximum tillering and produced more number of tillers, grain and straw yields over short and extra short duration cultivars viz., JGL 17004 and MTU 1010. Therefore, under assured irrigation and well distributed rainfall condition early sowing of long and medium duration cultivars would produce more yields under aerobic culture in Central Telangana Zone of Telangana State, India.

Citation: BalajiNaik, B., Sreenivas, G., Raji Reddy, D. and Leela Rani, P. 2016."TilleringBehaviour and Yield of Different Duration Rice Varieties under different Dates of Sowing under Aerobic Culture", *International Journal of Current Research*, 8, (05), 30143-30146.

INTRODUCTION

Rice is the staple food in Asia but also the single biggest user of fresh water. More than 80% of the developed fresh water resources in Asia are used for irrigation purposes and consumes up to 43 % of the world's developed irrigation resources (Boumane*t al.,* 2007). The country is second in production next to China. The amount and distribution of rainfall in India is strongly influenced by vagaries of monsoon. Inadequate rainfall, lack of water harvesting measures and misuse of water for agriculture have brought down the per capita availability of water by 40-60% in India. The high requirement of water for rice cultivation is due to traditional method of transplanting which is laborious, more water and time consuming. The high cost of farm labour invariably delays transplanting and often leads to the use of aged seedling. To address these problems, growing rice under aerobic soil conditions is evolved. Aerobic rice offers such advantages as faster and easier planting, could be successfully cultivated with 600 to 700 mm of total water in summer andentirely under rainfedduring wet season (Hittalmani, 2007a, 2007b)

****Corresponding author: BalajiNaik, B.,***
Agro Climate Research Centre, Rajendranagar, Hyderabad, Prof. Jayasankar Telangana State Agricultural University, Telangana.

and reduced labour cost, and often higher profit in areas with an assured water supply. However, at the same time, no varieties have been specifically developed for this purpose. The existing varieties used for rice culture do not appear to be well adapted for growth and yield under aerobic culture. On the other hand, characters such as straw yield, grain yield, number of productive tillers/plant, number of tillers/plant, and spikelet length were most affected by environment (Ramanjaneyulu*et al.*, 2014). Under these circumstances developing high yielding drought resistant varieties and the optimum date of sowing with good management practices are an important role under limited water situation in aerobic rice production system. Information on suitable rice varieties/hybrids and dates of sowing under aerobic condition are meagre in Central Telangana Zone of Telangana State. Keeping this in view, the present investigation was carried out to identify the promising cultivars and optimum date of sowing for enhancing higher productivity of aerobic rice.

MATERIALS AND METHODS

A field experiment was conducted for two consecutive seasons of *kharif,* 2012 and 2013 at Agriculture Research Station, Madhira situated at an altitude of 189 m above mean sea level

at 16°53' N latitude and 80°22' E longitude. The soil of the experiment cites was clay in texture, saline in reaction. The experiment was laid out in split plot design replicated thrice. The treatments combination comprised 5 sowing dates in the main plot *viz.*18 June (D_1), 7July (D_2), 20 July (D_3), 4 August (D_4) and 18 August (D_5) and 4 varieties in the sub plot *viz.* JGL 17004 (105 days), MTU 1010 (120 days), JGL 11470 (135 days) and MTU 1061 (160 days). The other crop management practices were carried out as per the recommended package of practices of PJTSAU. Irrigation was applied at @ 5 cm at 7 to 8 days interval to maintain upper limit of the field capacity in the soil from sowing to one week before harvest during dry spells in the season. The tillers production recorded at panicle initiation, heading and physiological maturity stages of the crop growth. The yield attributes and grain yield was recorded at harvest and straw yield was recorded 15 days after harvest in the field.

Tiller production m^{-2}

The data on number of tillers m^{-2} of aerobic rice in response to different dates of sowing was presented in Table 1 and depicted in Fig. 1. At panicle initiation stage, the maximum number of tillers m^{-2} (503) was recorded when the crop sown on 18 June (D_1) and reduced significantly from 7 July (D_2) to 18 August (D_5) in 2012. Whereas in 2013, on par tiller number m^{-2} (475 and 472) was observed from the crop sown on 18 June (D_1) and 7 July (D_2), respectively and were significantly superior to 20 July (D_3), 4 August (D_4) and 18 August (D_5) sown crop. At heading stage, the number of tiller m^{-2} noticed from 18 June (D_1) to 4 August (D_4) in 2012 and 18 June (D_1) to 20 July (D_3) in 2013 were comparable. But an abrupt and significant reduction in tillers m^{-2} was observed with 18 August (D_5) sown crop during 2012, whereas 4 August and 18 August (D_4 and D_5) sown crop in 2013. At harvest, the maximum number of 367 and 366tillers m^{-2} was recorded in 18 June (D_1) and 7 July (D_2) sown crop, respectively and which were on par to each other and thereafter declined significantly from 20 July (D_3) to 18 August (D_5) in 2012. In the present investigation the increased number of tillers under normal sown condition might be due to favourable environment conditions coupled with longer period of vegetative growth available to the crop when compared to the crop sown late in the season (Dawadi and Chaudhary, 2013). Further, Gill *et al.* (2006) also stated that, the productive tillers of crop sown on 1 and 10 June were at par and significantly superior to that of 20 June sown crop**.**

The data on number of tillers m^{-2} of aerobic rice verities in response to different dates of sowing was presented in Table 1 and depicted in Fig. 2. At panicle initiation stage, among all the varieties tested, more number of 511 and 499tiller m^{-2} was recorded with medium duration variety JGL 11470 (V_3) during 2012 and 2013, respectively and these two were significantly superior to short duration variety MTU 1010 (V_2) and extra short duration variety JGL 17004 (V_1). In contrast to above at heading stage, in 2012, the extra short duration variety, JGL 17004 (V_1) recorded significantly more number of (445) tillers m^{-2} over all other varieties. At harvest the medium duration variety JGL 11470 (V_3) recorded more number of tillers m^{-2} (353) and was at par with MTU 1061 (342) and significantly superior to other varieties JGL 17004 (V_1) and MTU 1010 (V_2). The difference between the numbers of tillers m^{-2} among the varieties grown under aerobic culture was also reported by Reddy *et al.* (2012) who evidently stated that, the number of tillers m^{-2} produced at 30 DAS was significantly higher with WGL-32100 compared to MTU-1001, WGL-14 and Keshava and at 60 DAS, highest number of tillers m^{-2} were recorded with WGL-14 followed by MTU-1001 and WGL-32100.The interaction effect of dates of sowing and varieties was found significant on tiller production only at panicle initiation stage during both the years of study (Table.2). The highest number of tillers m^{-2} was recorded with the long duration cultivar MTU 1061 (V_4) and was comparable with the medium duration variety JGL 11470 (V_3) produced significantly higher number of tiller m^{-2} when sown on 18 June during both the years and significantly superior to all other sowing dates and varieties.

Effective tiller m^{-2}

The data on effective tillers m^{-2} under different dates of sowing and varieties presented in the Table 1. Among the dates of sowings, the crop sown on 18 June (D_1) and 7 July (D_2) produced consistently maximum number of effective tillers m^{-2} (217 and 219) in 2012 and 2013, respectively and were on par with each other and significantly superior to 20 July (D_3), 4 August (D_4) and 18 August (D_5) sown crop. However, the number of effective tillers m^{-2} recorded from 20 July (D_3) to 18 August (D_5) sown crops was comparable with each other during both the years of study. The number of effective tillers m^{-2} at harvest is a vital determinant factor of grain yield in rice. The more number of effective tillers m^{-2} in early sown crop was due to the fact that the rice genotypes had longer duration for their vegetative growth compared to those sown late in the season.

These results are in conformity with those of Rai and Kushwaha (2008) who observed a marked reduction in the number of tillers m^{-2} at maturity stage in 15 July sown crop as compared with 15June and 1st July sown crop due to low minimum temperature experienced by the crop sown on 15 July as compared to 15 June and 1 July sown crop under aerobic condition which restricted the vegetative phase causing less tiller production. The higher number of effective tillers in early sown aerobic rice was also reported by Dawadi and Chaudhary (2013) and Muhammad *et al.,* (2010).Among the varieties the extra short and short duration varieties *viz*., JGL 17004 (V_1) and MTU 1010 (V_2) registered highest number of effective tillers m^{-2} and were on par with each other. But in turn these two varieties were significantly superior to medium duration variety JGL 11470 (V_3) and long duration variety MTU 1061 (V_4). The lowest number effective tillers m^{-2} in medium (V_3) and long (V_4) duration varieties than the extra short (V_1) and short (V_2) duration varieties might be due to prolonged growth period and more biomass production resulted in intra plant competition among the tillers for growth resources lead to mortality of tillers in long and medium duration varieties. These results were in conformity with the results of Gill *et al.* (2006) who reported that, the more number of tillers in short duration and medium duration varieties were due to more relative growth rate of these varieties to long duration variety.

Table 1. Tillers production and yield of rice varieties as influenced by dates of sowing under aerobic condition

Treatments	No. of tillers m^{-2}						Effective tillers m^{-2}		Grain yield (kg ha^{-1})		Straw yield (kg ha^{-1})	
	Panicle initiation		Heading		Harvest							
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Dates of sowing (D)												
18 June (D_1)	503	475	463	429	367	348	217	213	5422	4944	8611	7772
7 July (D_2)	476	472	442	423	366	349	219	212	5254	4893	8504	7857
20 July (D_3)	454	449	431	422	353	346	204	202	5005	4754	8354	7818
4 August (D_4)	423	412	408	399	331	333	199	195	4769	4377	8248	7675
18 August (D_5)	390	373	375	374	313	313	194	186	4573	4257	7901	7411
S.Em±	3	3	11	5	5	12	4	3	65	48	115	81
CD (p=0.05)	9	11	35	15	16	N.S.	13	10	211	156	374	263
Varieties (V)												
JGL 17004 (V_1)	336	343	445	425	340	333	214	216	3946	3752	6954	6288
MTU 1010(V_2)	455	406	422	398	337	322	220	210	5066	4632	8372	7538
JGL 11470 (V_3)	511	499	413	404	358	353	190	185	5459	5063	8768	8396
MTU 1061(V_4)	494	497	415	409	349	342	203	196	5547	5132	9199	8603
S.Em±	4	4	7	8	6	7	3	2	63	66	77	71
CD (p=0.05)	12	12	21	N.S.	N.S.	19	8	7	183	190	221	206
Interaction												
Dates × Variety	*	*	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 2. Number of tillers m^{-2} of different rice varieties as influenced by dates of sowing at panicle ignition stage under aerobic culture

Treatments	2012					2013				
	JGL 17 004	MTU 1010	JGL 11470	MTU 1061	Mean	JGL 17 004	MTU 1010	JGL 11470	MTU 1061	Mean
18-June	366	506	562	579	503	327	442	559	573	475
07-July	355	492	544	513	476	350	455	533	548	472
20-July	347	456	522	491	454	363	427	518	487	449
04-August	316	427	491	456	423	363	366	460	459	412
18-August	298	392	437	432	390	312	342	424	414	373
Mean	336	455	511	494	449	343	406	499	496	436
				S.Em±	CD (p=0.05)				S.Em±	CD (p=0.05)
Varieties at same date of sowing				6	27				7	27
Varieties at same or different dates of sowing				8	24				9	25

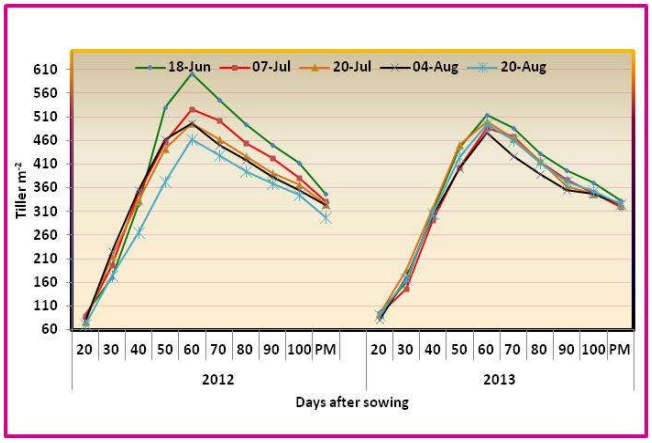

Fig 1. Tiller production in aerobic rice as influenced by different dates of sowing

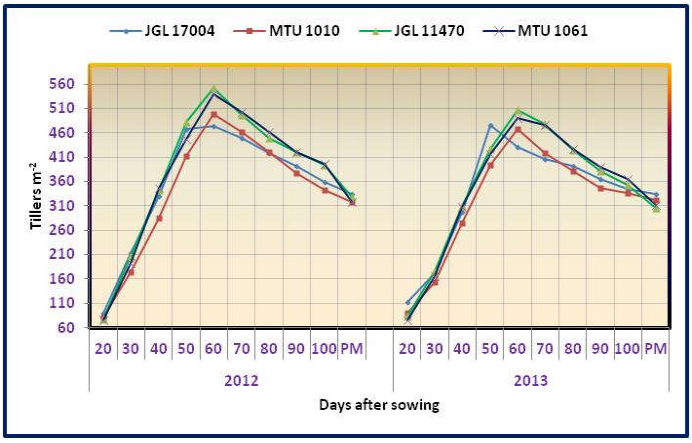

Fig. 2. Effect of dates of sowing on tiller production of different rice varieties

Grain yield and Straw yield (kg ha^{-1})

The results obtained on dates of sowing and verities under aerobic situation are presented in Table 1. Significantly more grain yield (5422 kg ha^{-1} and 4944 kg ha^{-1}) was realized from the crop sown on 18 June (D_1) and was comparable with grain yield (5254 and 4893kg ha^{-1}) of 7 July (D_2) sown crop and thereafter reduction in grain yield was noticed with every successive 15 days delay in sowing from 20 July (D_3) to 18 August (D_5) during 2012 and 2013, respectively (Table 5). These results were in conformity with the results of Rai and Kushwaha (2008) who reported 15.3% more grain yield of aerobic rice from 15 June sown crop when compared to late sowing of 15 July, which might be due to optimum period available for growth and development resulted in more storage of photosynthesis in the grain in early sown crop. Among the varieties tested, the long duration variety MTU 1061 (V_4) produced more grain yield (5547 kg ha^{-1} and 5132 kg ha^{-1})and was on par with the medium duration variety JGL 11470 (V_3), which in turn significantly superior to short (MTU 1010) and extra short (JGL 17004) duration varieties during 2012 and 2013, respectively. These results were in line with the findings of Patra *et al.* (2008) and Gopal (2008) who reported that, the grain yield in short and medium duration varieties were lower

than long duration varieties. The results from the Table 1 showed that, the highest straw yield (8611 kg ha^{-1} and 7772 kg ha^{-1}) was recorded in 18 June (D_1) sown crop and decreased thereafter with every 15 days delay in sowing from 7 July (D_2) to 18 August (D_5) during 2012 and 2013, respectively (Table 5). However, the decrease in straw yield with every successive 15 days delay in sowing was not significant from 7 July to 4 August (D_4) sown crops during both the years. Whereas, a significant reduction in straw yield was observed in 18 August (D_5) sown crop during both the years of study. These results were in accordance with the findings of Kumar *et al.* 2013, who reported that, the straw yield and harvest index was not differed significantly under different dates of sowing. Among the varieties tested, the long duration variety MTU 1061 (V_4) recorded significantly higher straw yield (9199 kg ha^{-1} and 8603 kg ha^{-1}) and was followed by the medium duration variety JGL 11470 (8768 kg ha^{-1} and 8396 kg ha^{-}),[1]which in turn significantly superior to short and extra short duration varieties viz., JGL 17004 (V_1) and MTU 1010 (V_2) in 2012 and 2013, respectively. The difference in straw yield among the varieties was also noticed from studies of Praveen *et al.* (2013) who reported that, the highest straw yield was recorded with Karma Mahsuri followed by Mahamaya and lowest was observed in MTU 1010.

Conclusion

From the present investigation it was concluded that, under assured irrigation and well distributed rainfall condition early sowing of long (MTU 1061) and medium (JGL 11470) duration cultivars could produce more yield whereas under delayed situation, short and extra short duration cultivar performs better under aerobic situation.

REFERENCES

Bouman, B.A.M., Humphereys, E., Tuong, T.P and Barker, R. 2007. Rice and water. *Advances in Agronomy* 92: 187-237.

Dawadi, K.P and Chaudhary, N.K. 2013. Effect of sowing dates and varieties on yield and yield attributes of direct seeded rice in Chitwan, Nepal. *International Journal of Agricultural Science Research. 2(4) :* 095-102.

Gill, M.S., Ashwani Kumar and Pradeep Kumar. 2006. Growth and yield of rice cultivars under various methods and times of sowing. *Indian Journal of Agronomy.* 51(2): 123-127.

GOI (Government of India) 2013.Economic survey (2012-13).Union Ministry of Finance, GOI, New Delhi. pp. A

Gopal, R. 2008. Zero tillage rice establishment and crop weed dynamics in rice and wheat cropping systems in India and Australia *Project Annual Report* : p 27.

Hittalmani, S. 2007a. Aerobic rice cultivation Brochure, MAS lab, Univ. Agric. Sci., GKVK, Bangalore.

Hittalmani, S. 2007b. MAS946-1, A new aerobic rice variety for water scarce situation. Aerobic rice cultivation Brochure, MAS lab, Univ. Agric. Sci., GKVK, Bangalore.

Kumar, M., Anup Das, Ramkrishna, G.I., D.P.Patel, G.C. Munna, Naropongla and Juri Burangohain. 2013. Effect of nutrient sources and transplanting date on aromatic rice (*Oriza sativa*) under mid hills of north eastern India.*Indian Journal of Agronomy.* 58(3): 322-326.

Muhammad Usman Bashir*, Nadeem Akbar, AsifIqbal and HaroonZaman. 2010. Effect of different sowing dates on yield and yield components of direct seeded coarse rice (*Oryzasativa* L). *Pak. J. Agri. Sci. 47(4): 361-365;*

Patra P.S., Sonowal, M. and S. Biswas.2008.Studies on tillering habit and yield of some *Kharif*rice cultivars as influenced by transplanting date under terai region of West Bengal. *Journal of Crop and Weed.* 4(2): 7-9

Praveen, K.V., Patel, S.R., Choudhary, J.L and Bhelawe, S. 2013. Heat Unit Requirement of Different Rice Varieties under Chhattisgarh Plain Zones of India*. J. Earth Sci. Clim Change,* 5(1) an open access journal.

Rai, H.K and Kushwaha, H.S. 2008.Effect of planting dates and soil water regimes on growth and yield of upland rice. *Oryza* .45(1) : 129-132.

Ramanjaneyulu1, A.V. Gouri Shankar, V., Neelima, T.L and D. Shashibhusahn. 2014. Genetic nalysis of Rice (*Oryza Sativa* L.) Genotypes under Aerobic Conditions on Alfisols*. SABRAO Journal of Breeding and Genetics 46 (1)*: 99-111

Reddy, M.M,B., Padmaja, G., Veeranna and Vishnu Vardhan Reddy, D. 2012. Evaluation of popular *kharif*rice (*Oryza sativa* L.) varieties under aerobic condition and their response to nitrogen dose. *J.Res. ANGRAU.* 40(4): 14-19.

Tuong, T.P and Bouman, B.A.M. 2002. Rice production in water scarce environments. *Tobe published in proceedings of the water productivity workshop,* 12-14 Nov.2001, International Water Management Institute, Sri Lanka.18-A 20.

****