Int.J.Curr.Microbiol.App.Sci (2017) Special Issue-4: 125-130

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Special Issue-4 (September-2017) pp. 125-130**
Journal homepage: http://www.ijcmas.com

Original Research Article

Growth Parameters, Yield and Economics of Basmati Rice as Influenced by Different Date of Transplanting and Weed Management Practices

Vikram Kumar*, D. P. Nandal, Sunil Kumar, R. K. Singh and Mukesh Kumar Sheshama

Department of Agronomy, CCSHAU, College of Agriculture, Hisar-125004, HR, India
**Corresponding author*

Keywords

Basmati rice, bispyribac, oxadiargyl, Pretilachlor, quality, transplanting date, yield

A B S T R A C T

A field experiment was conducted during kharif 2014 at students' farm of CCSHAU, college of agriculture, Kaul (Kaithal). The experiment consisted of four transplanting dates (June 15, July 5, July 25 and August 15) in main plots and six weed control treatments in sub plots treatments consisted of pre-emergence application of pretilachlor, oxadiargyl alone and sequential application of pre and post emergence herbicides *viz.*, pretilachlor *fb* bispyribac, oxadiargyl *fb* bispyribac, weed free check and unweeded check.. Results were revealed that growth parameters, yield (4363 kg/ha) and economics were highest with pre-emergence application of oxadiargyl followed by bispyribac-sodium transplanted at 15th June, which was at par with 5th July with same weed management practices.

Introduction

Rice (*Oryza sativa* L.) production constitutes the major economic activity and a key source of employment for the rural population of India. The average yield of rice in India has been increased as a result of many research activities by more than 2% per year but still far less than other leading rice growing countries (Ito *et al.,* 1989). Among the crop production tools, proper time of transplanting is the prerequisites that allow the crop to complete its life phase timely and successfully under a specific agro-ecology. The productivity of rice in India is declining due to an array of biotic and abiotic factors. Weed competition is one of the important biotic constraints in rice production. Weeds can cause a reduction of 28-45% of grain yield in transplanted rice (Singh *et al.,* 2003). The use of herbicides offers scope for economical control of weeds right from the beginning, giving rice crop an advantage of good start and competitive superiority. Continuous application of these voluminous herbicides year after year may lead to shift in weed flora from grassy to non-grassy weeds and sedges and development of herbicide resistance in weeds (Rajkhowa *et al.,* 2006). Recent trend of herbicide use is to find out an alternative and effective weed control measure by using low dose high efficiency herbicides, which will not only reduce the total volume of herbicide per unit area, but also make the application easier and economical to the farmer. Of late, some of the promising low dose high efficacy pre-

and post-emergence herbicides are available for control of wide spectrum of weed flora in lowland rice (Moorthy, 2002).

Materials and Methods

The study was undertaken during 2014 at student's farm of CCSHAU, college of agriculture, Kaul (Kaithal), Hisar (latitude 29° 51' N, longitude 76° 41' E and altitude 241 metres above mean sea level). The soil of the experimental site was clay loam in texture with pH 8.2. It was moderately fertile, being low in organic carbon (0.32%), available N (161 kg/ha) and medium in available P (16 kg/ha) and high K (330 kg/ha). The experiment was laid out in split plot design with four date of transplanting and six weed management treatments in three replication. The treatments were, 15th June, 5th July, 25th July and 15th August. The weed management treatment included, pre-emergence application of pretilachlor 1000 g/ha, oxadiargyl 100 g/ha alone and sequential application of pre- and post-emergence herbicides *viz.*, pretilachlor 1000 g/ha+bispyribac 25 g/ha, oxadiargyl 100 g/ha+bispyribac 25 g/ha, weed free check and unweeded check. The date of transplanting were kept in main plot whereas; weed management treatments adjust in sub-plots. An uniform dose of 120 kg N + 60 kg P + 60 kg K + 5 kg Zn/ha was applied in all the treatments in the form of urea, DAP, MOP and ZnSO4, respectively. Half of total N and full dose of P_2O_5, K_2O and Zn was applied as basal and remaining half dose of N was top dressed in two equal splits at active tillering and panicle initiation stage. Rice *cv* 'Pusa *basmati* - 1509' of 120 duration was used as test variety. The total rainfall received during crop season was 700 mm during crop period. Pre-emergence (just after sowing) and post-emergence (as per treatments) herbicides were applied with the help of a hand- operated knapsack sprayer fitted with flat-fan nozzle.

Results and Discussion

Crop growth parameters

Since rice variety Pusa *basmati* 1509 was transplanted at a hill spacing of 20 x 15 cm, therefore, plant population was 33 hills/m^2 for all the treatments. Plant height increased with advancement in crop age up to 90 DAT (days after transplanting). The highest increase in plant height was observed between 30 and 60 DAT and minimum increase from 60 to 90 DAT. Crop planted on June 15 caused a significantly better height than all of the delayed transplanting dates except July 5 which was statistically at par to the earlier. This might be due to longer vegetative period of the crop under early transplanting, due to which the plants accumulated more photosynthates which were utilized for growth of vegetative organs of the plant. Comparatively lower temperature conciding with panicle initiation under late planting resulted into shorter plants. Paliwal *et al.*, (1996) also reported that late planting reduced plant height of *basmati* cultivars. Among the weed management practices, weed free plots recorded significantly taller plants at 30, 60 and 90 DAT (63.2, 93.9 and 104.2 cm, respectively) which were at par to that recorded with application of oxadiargyl followed by bispyribac-sodium (61.6, 92.2 and 101.7 cm, respectively) and pretilachlor followed by bispyribac-sodium (60.7, 91.9 and 101.2 cm, respectively). The weedy check produced significantly shortest plants at 30, 60 and 90 DAT (55.8, 84.6 and 94.7 cm, respectively) compared to all other weed control treatments. These results are in agreement with Gistopoulos and Williams (2004).

Higher number of tillers/m^2 with the advancement of crop age up to 60 DAT but decreased towards maturity. The crop planted on June 15 which was statistically at

par to July 5 planting, produced significantly higher number of tillers than delayed planting (July 25 and August 15). Sequential application of herbicide produced significantly more number of tillers/m^2 than individual application of oxadiargyl and pretilachlor. Significantly lowest number of tillers was recorded under weedy check at all the growth stages (Lakshmi and Ramana 2008). This might be due to favorable environment for production of more number of tillers through reduced weed competition during critical periods and increased the availability of growth resources.

The dry matter accumulation increased with advancement of crop age. The highest increase in dry matter was observed between 30 and 60 DAT. At all the crop growth stages, crop planted on June 15 which was statistically at par to July 5 planting, produced significantly higher crop dry matter than delayed planting (July 25 and August 15).

In case of weed management practices, weed free treatment recorded highest crop dry matter accumulation at 30, 60 and 90 DAT (162, 665 and 964 g/m^2) and it was at par to the application of oxadiargyl followed by bispyribac-sodium (160, 657 and 953 g/m^2) and pretilachlor followed by bispyribac-sodium (154, 629, and 914 g/m2, respectively). These findings are in accordance with those of Subramanyam *et al.,* (2007).

The grain yield decreased significantly due to delayed transplanting. The crop planted on June 15 produced the highest grain yield (4346 kg/ha) which was statistically at par to July 5 planting. Among the all weed control treatments showed significant increase in grain yield over weedy check. Weed free treatment registered significantly highest grain yield (4516 kg/ha), than all other treatments except oxadiargyl followed by bispyribac-sodium (4376 kg/ha). However, application of oxadiargyl followed by bispyribac-sodium was statistically similar to pretilachlor followed by bispyribac-sodium. No interaction was observed between the dates of transplanting and weed management practices. This was mainly due to lesser crop weed competition for growth resources during entire crop growth period and promoted the growth components *viz.,* plant height, dry matter production and total number of tillers/m^2 and yield components *viz.,* effective tillers/m^2 with more number of filled grains/panicle and test weight. The cumulative effect of all these growth and yield components resulted in increased grain and straw yields. The results are in conformity with those of Jadhav *et al.,* (2008), Walia *et al.,* (2008) and Yadav *et al.,* (2009).

Economics

Cost of cultivation was found similar under different transplanting dates. The lowest total cost of cultivation was obtained from weedy treatment (Rs. 85918/ha) followed by alone application of oxadiargyl (Rs. 87537/ha). The highest gross income was obtained from early transplanting (June 15) crop (Rs. 131525/ha), followed by July 5 (Rs. 123161/ha). Similar results were observed by Gangwar and Sharma (1998). Among all weed control treatments, highest gross income was obtained with weed free check (Rs. 135951/ha). Oxadiargyl followed by bispyribac-sodium (Rs. 131895/ha) was the second best in this respect. The highest net income was obtained with June 15 transplanting (Rs. 39658/ha) followed by July 5 (Rs. 31294/ha) transplanting. Among all weed control treatments, highest net income was obtained with oxadiargyl followed by bispyribac-sodium (Rs. 41340/ha).

Table.1 Effect of different transplanting date and weed management practices on growth parameters and yield

Treatments	Plant height (cm)			Number of tillers m^{-2}			Drymatter accumulation (g m^{-2})			
	30 DAS	60 DAS	At harvest	30 DAS	60 DAS	At harvest	30 DAS	60 DAS	At harvest	Grain yield (kg/ha)
Sub plot (weed control treatments)										
15-Jun	65.6	94.3	104.9	288	305	301	160	656	952	4346
05-Jul	61.6	92.4	102.8	266	279	275	146	601	871	4058
25-Jul	60.3	89.2	97.6	248	265	261	139	570	827	3918
15-Aug	56.3	84	92	225	240	236	126	516	748	3289
SEm±	1.2	1.5	1.7	7	8	7	4	16	24	109
CD at 5%	4.3	5.4	6	25	27	26	14	58	84	383
Sub plot (weed control treatments)										
Oxadiargyl 100g/ha (PE)	60.1	89.4	100	248	265	262	139	570	828	3804
Pretilachlor 1000g/ha (PE)	59.3	88.2	99.6	226	242	239	127	521	756	3475
Oxadiargyl 100g/ha (PE) *fb* bispyribac-Na 25g/ha (25 DAT)	61.6	92.2	101.7	286	305	301	160	657	953	4376
Pretilachlor 1000g/ha (PE) *fb* bispyribac-Na 25g/ha (25 DAT)	60.7	91.9	101.2	280	293	289	154	629	914	4196
Weed free	63.2	93.9	104.2	295	309	305	162	665	964	4516
Weedy	55.8	84.6	94.7	205	219	216	115	472	684	3151
SEm±	0.9	0.9	1.2	5	6	6	3	12	18	83
CD at 5%	2.7	2.6	3.6	16	17	17	9	36	52	238

Table.2 Effect of different transplanting date and weed management practices on economics of different treatments

Treatments	Total cost (Rs./ha)	Gross income (Rs./ha)	Net income (Rs./ha)	B:C
Main plot (transplanting dates)				
15-Jun	91867	131525	39658	1.43
05-Jul	91867	123161	31294	1.34
25-Jul	91867	119120	27253	1.29
15-Aug	91867	100863	8995	1.1
Sub plot (weed control treatments)				
Oxadiargyl at 100g/ha (PE)	87537	115306	27769	1.32
Pretilachlor at 1000g/ha (PE)	88902	105784	16882	1.19
Oxadiargyl at 100g/ha (PE) *fb* bispyribac-Na at 25g/ha (25 DAT)	90554	131895	41340	1.46
Pretilachlor at 1000g/ha (PE) *fb* bispyribac-Na at 25g/ha (25 DAT)	91920	126678	34758	1.38
Weed free	105801	135951	30149	1.28
Weedy	85918	96390	9900	1.15

The highest benefit cost ratio was obtained with June 15 (1.43) and the ratio decreased with each successive delayed in transplanting. Among weed control treatments, highest BC ratio was obtained with oxadiargyl followed by bispyribac-sodium (1.46). These results are in accordance with those of Singh and Kumar (1999). From the results of the present field experiment on response of *basmati* rice variety (Pusa *basmati* 1509) to time of transplanting conducted during *Kharif* 2014, it can be concluded that transplanting of *basmati* rice from June 15 to July 5 is optimum as it not only gave significantly higher grain yield but also fetched additional income than late planting (August 15). Among the weed control treatments, the highest grain yield and economic returns were found in pre-emergence application of oxadiargyl followed by bispyirbac-sodium applied at 25 DAT.

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