Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2020; 9(6): 955-958
Received: 23-08-2020
Accepted: 26-10-2020

VR Pusdekar
P.G. Student, Agronomy Section, College of Agriculture, Nagpur, Maharashtra, India

PC Pagar
Assistant Professor, Agronomy Section, College of Agriculture, Nagpur, Maharashtra, India

RB Kothikar
Junior Research Assistant, Agronomy Section, College of Agriculture, Nagpur, Maharashtra, India

NR Mairan
Senior Research Assistant, Agronomy Section, College of Agriculture, Nagpur, Maharashtra, India

ST Dangore
Assistant Professor, Agronomy Section, College of Agriculture, Nagpur, Maharashtra, India

Corresponding Author:
VR Pusdekar
P.G. Student, Agronomy Section, College of Agriculture, Nagpur, Maharashtra, India

Effect of pre and post emergence herbicide on growth, yield and economics of diect seeded lowland rice

VR Pusdekar, PC Pagar, RB Kothikar, NR Mairan and ST Dangore

Abstract
A field experiment was conducted during *Kharif* season of 2019-20 at Agronomy Research Farm, College of Agriculture, Nagpur, to study the effect of pre and post emergence herbicides on growth, yield and economics of direct seeded lowland rice. In respect of crop studies, weed free treatment (T_2) recorded significantly higher plant height, number of tillers m^{-2}, dry matter accumulation m^{-2}, number of panicles m^{-2}, number of grains $panicle^{-1}$, grain yield (3541 kg ha^{-1}) and straw yield (5041 kg ha^{-1}) of paddy followed by pre emergence application of Pretilachlor 50 EC @ 0.75 kg a.i. ha^{-1} *fb* post emergence application of Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS *fb* hoeing at 35 DAS (T_8) and pre emergence application of Oxydiargyl 6% EC @ 100 g a.i. ha^{-1} *fb* post emergence application of Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS *fb* hoeing at 35 DAS (T_9). Maximum gross monetary returns (Rs.66789 ha^{-1}), net monetary returns (Rs. 39617 ha^{-1}) and B:C ratio (2.45) was obtained by the weed free treatment (T_2) followed by pre emergence application of Pretilachlor 50 EC @ 0.75 kg a.i. ha^{-1} *fb* post emergence application of Bispyribac sodium 10 SC @ 20 g a.i.ha^{-1} at 20 DAS *fb* hoeing at 35 DAS (T_8) and pre emergence application of Oxydiargyl 6% EC @ 100 g a.i. ha^{-1}*fb* post emergence application of Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS *fb* hoeing at 35 DAS (T_9).

Keywords: pretilachlor, oxydiargyl, bispyribac sodium, grain yield

Introduction
Rice is one of the most important staple food grain crop of the world, which constitute the principle food for about 60% of the world's human population and two third of Indian population. Among the cereals, rice is the major source of calories for 40% and proteins for the 17% of the world population and is the main livelihood of the rural population in many Asian, African, and Latin American countries.

Weeds are the major constraints in direct seeded lowland rice. Immediately after sowing the field dries up and as a consequence of alternate drying and wetting an aggressive flush of weeds come up in the early growth stage of the crop thereby compete with the rice seedlings for various growth factors. This leads to drastic reduction in yield due to heavy competition offered by weeds in seedling stage.

Similarly, due to continuous rains and unavailability of labours in peak period of rice growth, weeding or hoeing operations could not be performed. Under such circumstances pre emergence herbicides could provide weed free condition during emergence of paddy seedlings and further weed growth could be controlled by early post emergence herbicides thereby reducing the crop-weed competition.

Bhurer *et al.*, (2013) [2] revealed that application of Pendimethalin (1 kg a.i. ha^{-1}) fb 2,4-D (1 kg a.i. ha^{-1}) at 25 DAS and HW 45 DAS was found the best for obtaining higher yield and weed control efficiency in dry direct seeded rice (DDSR). Antralina *et al.*, (2015) [1] showed that weed control using herbicides containing Bispyribac sodium and 2,4-D + Methyl metsulfuron showed similar results as manual weed control on rice yield. In view of above the present investigation is planned to evaluate the effect of pre and post emergence herbicide on growth and yield of direct seeded lowland rice.

Material and Methods
A field experiment was conducted during *Kharif* season of 2019-20 at Agronomy Research Farm, College of Agriculture, Nagpur with 9 weed management treatments i.e., T_1 (Weedy check), T_2 (Weed free check), T_3 (PE Pendimethalin 30 EC @ 1.5 kg a.i. ha^{-1} *fb* hoeing at 35 DAS), T_4 (PE Pretilachlor 50 EC @ 0.75 kg a.i. ha^{-1} *fb* hoeing at 35 DAS), T_5 (PE Oxydiargyl 6% EC @ 100 g a.i. ha^{-1} *fb* hoeing at 35 DAS), T_6 (PoE Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS *fb* hoeing at 35 DAS), T_7 (PE Pendimethalin 30 EC @ 1.5 kg a.i. ha^{-1} *fb*

PoE Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS *fb* hoeing at 35 DAS), T_8 (PE Pretilachlor 50 EC @ 0.75 kg a.i. ha^{-1} *fb* PoE Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS *fb* hoeing at 35 DAS), T_9 (PE Oxydiargyl 6% EC @ 100 g a.i. ha^{-1} *fb* PoE Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS *fb* hoeing at 35 DAS), in Randomized Block Design with 3 replications.

The soil of experimental plot was silty clay in texture having slightly alkaline to neutral pH. As regards to fertility status, it was low in available nitrogen, moderate in available phosphorus, fairly rich in available potassium and moderate in organic carbon content (0.58%). The variety "Sindewahi-1" was sown in lines on 06/07/2019 and harvested on 05/11/2019. The weed management treatments were imposed as per treatments.

Results and Discussion

Growth attributes

The treatment weed free check (T_2) recorded significantly maximum plant height and number of tillers m^{-2} over all other treatments at all the periodical observations. Amongst various herbicidal treatments, treatment PE Pretilachlor 50 EC @ 0.75 kg a.i. ha^{-1} *fb* PoE Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS *fb* hoeing at 35 DAS (T_8) and PE Oxydiargyl 6% EC @ 100 g a.i. ha^{-1} *fb* PoE Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS *fb* hoeing at 35 DAS (T_9) being at par with each other recorded significantly higher plant height and number of tillers m^{-2} over all other herbicidal and weedy check treatments at all growth stages.

The increased in plant height of paddy and number of tillers m^{-2} under weed management treatments might be due to good aeration of soil and least weed population observed in these treatments which reduced the crop-weed competition for soil moisture, plant nutrients, solar radiation and space during active growth period. These findings were in accordance with the results reported by Kachroo and Bazaya (2011) [3].

They studied the effect of pretilachlor @ 0.5 kg ha^{-1} at 6 DAS *fb* rotary hoe at 20 DAS produced maximum plant height and number of effective tillers and reduced weed population and dry weight of weeds.

This might be attributed to better growth of plants on account of reduced weed competition at critical crop growth stages resulting in increased availability of nutrients, water and light than the other.

All weed control treatment significantly influenced the dry matter accumulation m^{-2} at harvest. The dry matter accumulation m^{-2} in weed free check treatment (T_2) was significantly more at harvest over rest of the treatments. Treatment PE Pretilachlor 50 EC @ 0.75 kg a.i. ha^{-1} *fb* PoE Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS *fb* hoeing at 35 DAS (T_8) and PE Oxydiargyl 6% EC @ 100 g a.i. ha^{-1} *fb* PoE Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS *fb* hoeing at 35 DAS (T_9) were found comparable in respect of dry matter accumulation m^{-2} and were significantly superior over all other herbicidal treatments at harvest. Treatment T_1 (weedy check) recorded least dry matter accumulation m^{-2} at harvest.

The increased in dry matter accumulation m^{-2} in weed free check and herbicidal treatments might be due to less crop-weed competition and good aeration of soil, there by facilitating luxurious crop growth resulting into more dry matter accumulation m^{-2} as compared to weedy check treatment.

These results were in agreement to that of Prakash *et al*., (2017) [4], they revealed that the significantly higher dry matter accumulation at harvest (1333.90 & 1351.53 g m^{-2}) was achieved with application of bispyribac + almix except at par with pretilachlor *fb* almix, Bispyribac + ethoxysulfuron, Pretilachlor *fb* ethoxysulfuron.

Yield and yield attributes

Treatment weed free check (T_2) recorded significantly greater number of panicles m^{-2}, grains panicle^{-1} and grain weight m^{-2} as compared to other treatments. The treatment PE Pretilachlor 50 EC @ 0.75 kg a.i. ha^{-1} *fb* PoE Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS *fb* hoeing at 35 DAS (T_8) and PE Oxydiargyl 6% EC @ 100 g a.i. ha^{-1} *fb* PoE Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS *fb* hoeing at 35 DAS (T_9) being at par with each other recorded significantly higher number of panicles m^{-2}, grains panicle^{-1} and grain weight m^{-2} over other herbicidal treatments. Minimum number of panicles m^{-2}, grains panicle^{-1} and grain weight m^{-2} was found in weedy check (T_1) treatment.

The increased in number of panicles m^{-2}, number of grains panicle^{-1} and grain weight m^{-2} might be due to reduction in dry matter production of weeds under herbicidal and cultural treatments that subsequently increased nutrient and moisture availability to the paddy crop as compared to rest of the treatments. The different treatments did not show any significant effect on test weight. However, treatment weedy check (T_1) recorded minimum test weight while weed free check treatment (T_2) recorded maximum test weight of grains. Results are in conformity with the findings of Singh and Singh (2010) [7] who concluded that application of pretilachlor (0.75 kg a.i. ha^{-1} pre-emergence) *fb* 2,4-D (0.50 kg a.i. ha^{-1} post-emergence) showed highest number of panicles m^{-2}, grains panicle^{-1} and 1000 grain weight over the control and Rajkhowa *et al*., (2007) [5] who suggested that, pretilachlor 0.75 kg ha^{-1} and weed free treatment significantly control the weeds and improved the yield attributes in rice *viz*., panicle number, panicle length and grains panicle^{-1} and decreased crop-weed competition during the critical crop growth stages over unweeded control.

The treatment weed free check (T_2) produced significantly maximum paddy grain yield (3541 kg ha^{-1}) and straw yield (5041 kg ha^{-1}) as compared to all other treatments. As regards herbicidal treatments, the treatment PE Pretilachlor 50 EC @ 0.75 kg a.i. ha^{-1} *fb* PoE Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS *fb* hoeing at 35 DAS (T_8) and PE Oxydiargyl 6% EC @ 100 g a.i. ha^{-1} *fb* PoE Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS *fb* hoeing at 35 DAS (T_9) produced significantly higher grain yield (3224 kg ha^{-1} and 3156 kg ha^{-1}, resp.) and straw yield (4903 kg ha^{-1} and 4845 kg ha^{-1}, resp.) over all other herbicidal treatments and were found at par with each other. The treatment weedy check (T_1) recorded minimum grain yield of paddy (1971 kg ha^{-1}) and straw yield (3807 kg ha^{-1}) as compared to all other treatments.

Mechanical as well as chemical treatment in combination with mechanical practices were effective in reducing weed population, weed dry matter production and increasing grain yield of paddy. Beneficial effect of mechanical method and pre-emergence application of Pretilachlor and Oxydiargyl and post-emergence application of Bispyribac sodium in combination with mechanical method might be due to suppression of monocot and dicot weeds which helped in reducing soil moisture and nutrient losses by weeds and making it available to the paddy crop thereby increasing yield of crop. Similar results were found by Sindhu *et al*., (2010) [6] that, pretilachlor + HW recorded the highest grain yield of 3.20 t ha^{-1} over the weed control treatment.

Maximum harvest index recorded by the treatment weed free check (T_2) (41.26) followed by PE Pretilachlor 50 EC @ 0.75 kg a.i. ha^{-1} *fb* PoE Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS *fb* hoeing at 35 DAS (T_8) and PE Oxydiargyl 6% EC @ 100 g a.i. ha^{-1} *fb* PoE Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS *fb* hoeing at 35 DAS (T_9) whereas least harvest index was observed in weed check treatment (T_1) (34.11).

Economics

The treatment weed free check (T_2) recorded significantly maximum GMR (Rs. 66789 ha^{-1}), NMR (Rs. 39617 ha^{-1}) and B:C ratio (2.45) as compared to all other treatments. As regards herbicidal treatments, application of PE Pretilachlor 50 EC @ 0.75 kg a.i. ha^{-1} *fb* PoE Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS *fb* hoeing at 35 DAS (T_8) and PE Oxydiargyl 6% EC @ 100 g a.i. ha^{-1} *fb* PoE Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS *fb* hoeing at 35 DAS (T_9) recorded higher GMR, NMR and B:C ratio and were significantly superior over other herbicidal treatments and were also found at par with each other. The treatment weedy check (T_1) recorded minimum GMR (Rs.37677 ha^{-1}), NMR (Rs.18302 ha^{-1}) and B:C ratio (1.94) amongst all treatments.

The highest economic returns in weed management treatments might be due to higher grain yield of paddy which is attributed due to effective control of weeds by these treatments that had positive effect on crop growth and yield. The treatment weedy check (T_1) recorded lowest economic returns as a result of higher crop-weed competition which reduced the paddy yield significantly.

The results are in accordance to findings of Sunil *et al*., (2010) [8] who conducted a field experiment in rice and found that pre-emergence application of bensulfuron-methyl + pretilachlor (6.6 GR) @ 0.06 + 0.60 kg ha^{-1} (pre-mix formulation) applied at 3 DAS + one cultivation of 40 DAS resulted maximum B:C ratio (2.29) as compared to other treatments.

Table 1: Plant height, number of tillers, plant dry matter accumulation, number of panicles, number of grains, test weight and grain weight as influenced by different weed control treatments

	Treatments	Plant height (cm) at harvest	Number of tillers (m^{-2}) at harvest	Plant dry matter accumulation (gm^{-2}) at harvest	Number of panicles (m^{-2})	Number of grains panicle^{-1}	Test weight (g)	Grain weight (gm^{-2})
T_1	Weedy check	62.32	159.80	367.19	129	141	15.68	232.2
T_2	Weed free check	80.52	252.64	536.25	224	170	16.82	468.2
T_3	PE Pendimethalin 30 EC @ 1.5 kg a.i. ha^{-1} fb hoeing at 35 DAS	74.43	206.50	433.53	173	145	15.99	341.3
T_4	PE Pretilachlor 50 EC @ 0.75 kg a.i. ha^{-1} fb hoeing at 35 DAS	75.10	22.32	461.44	181	150	16.09	381.3
T_5	PE Oxydiargyl 6% EC @ 100 g a.i. ha^{-1} fb hoeing at 35 DAS	75.14	214.62	451.78	179	148	16.18	394.0
T_6	PoE Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS fb hoeing at 35 DAS	76.05	230.02	463.47	188	147	16.01	366.0
T_7	PE Pendimethalin 30 EC @ 1.5 kg a.i. ha^{-1} fb PoE Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS fb hoeing at 35 DAS	76.94	234.92	471.59	195	152	16.26	407.7
T_8	PE Pretilachlor 50 EC @ 0.75 kg a.i. ha^{-1} fb PoE Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS fb hoeing at 35 DAS	78.24	240.86	522.28	213	164	16.65	453.7
T_9	PE Oxydiargyl 6% EC @ 100 g a.i. ha^{-1} fb PoE Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS fb hoeing at 35 DAS	77.41	239.58	521.56	206	159	16.51	441.2
	SE (m)±	0.33	0.51	0.48	2.8	2	1.00	4.3
	CD at 5%	0.99	1.54	1.45	8.5	6	N.S.	13.2
	GM	75.13	22.47	469.90	187.5	152	16.24	386.9

Table 2: Grain yield, straw yield, harvest index and economics of direct seeded lowland rice as influenced by different weed control treatments

	Treatments	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})	Harvest Index (%)	GMR (Rs ha^{-1})	NMR (Rs ha^{-1})	B: C ratio
T_1	Weedy check	1971	3807	34.11	37677	18302	1.94
T_2	Weed free check	3541	5041	41.26	66789	39617	2.45
T_3	PE Pendimethalin 30 EC @ 1.5 kg a.i. ha^{-1} fb hoeing at 35 DAS	2643	4343	37.85	50143	25038	1.99
T_4	PE Pretilachlor 50 EC @ 0.75 kg a.i. ha^{-1} fb hoeing at 35 DAS	2898	4536	38.98	54867	29688	2.18
T_5	PE Oxydiargyl 6% EC @ 100 g a.i. ha^{-1} fb hoeing at 35 DAS	2762	4487	38.10	52374	27258	2.09
T_6	PoE Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS fb hoeing at 35 DAS	2978	4613	39.23	56358	30795	2.20
T_7	PE Pendimethalin 30 EC @ 1.5 kg a.i. ha^{-1} fb PoE Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS fb hoeing at 35 DAS	3078	4734	39.40	58233	32663	2.27
T_8	PE Pretilachlor 50 EC @ 0.75 kg a.i. ha^{-1} fb PoE Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS fb hoeing at 35 DAS	3224	4903	39.67	60968	35067	2.35
T_9	PE Oxydiargyl 6% EC @ 100 g a.i.ha^{-1} fb PoE Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS fb hoeing at 35 DAS	3156	4845	39.45	59704	33852	2.31
	SE (m)±	35	23	-	613	613	-
	CD at 5%	105	70	-	1839	1839	-
	GM	2917	4590	-	55235	30253	-

Conclusion

In direct seeded lowland rice, pre-emergence application of Pretilachlor 50 EC @ 0.75 kg a.i. ha^{-1} or Oxydiargyl 6% EC @ 100 g a.i. ha^{-1} *fb* post-emergence Bispyribac sodium 10 SC @ 20 g a.i. ha^{-1} at 20 DAS *fb*1 hoeing at 35 DAS increased growth parameters and yield contributing characters thereby increasing yield and economic returns of rice.

References

1. Antralina M, Istina IN, Yuwariah Y, Simarmata T. Effect of difference weeds control methods to yield of lowland rice in the SOBARI. Procedia Food Sci 2015;3:323-329.
2. Bhurer KP, Yadav DN, Ladha JK, Thapa RB, Pandey KR. Efficacy of various herbicides to control weeds in drydirect seeded rice (Oryza sativa L.). *G.J.B.A.H.S* 2013;2(4):205-212.

3. Kachroo D, Bazaya BR. Efficacy of different herbicides on growth and yield of direct wet seeded rice sown through drum seeder. Indian J. Weed Sci 2011;43(1-2):67-69.
4. Prakash J, Singh R, Yadav RS, Vivek RB, Yadav BP, Dhyani RS, *et al*. Effect of different herbicide and their combination on weed dynamics in transplanted rice. Res. J Chem. Environ. Sci 2017;5(4):71-75.
5. Rajkhowa DJ, Deka NC, Borah N, Barua IC. Effect of herbicides with or without paddy weeder on weeds in transplanted. Indian J Agron 2007;52(2):107-110.
6. Sindhu PV, Thomas CG, Abraham CT. Seedbed manipulations for weed management in wet seeded rice. Indian J Weed Sci 2010;42(3-4):173-179.
7. Singh M, Singh RP. Influence of crop establishment methods and weed management practices on yield and economics of direct-seeded rice (Oryza sativa). Indian J Agron 2010;55(3):224-229.
8. Sunil CM, Shekara BG, Kalyanmurth KN, Shankaralingapa BC. Growth and yield of aerobic rice as influenced by integrated weed management practices. Indian J Weed Sci 2010;42:180-183.