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Impact of sowing time and weed management practices on yield of direct-seeded rice

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Abstract
A field experiment was conducted during the *Kharif* season of 2019 and 2020 at Zonal Agricultural Research station Powarkheda, Narmadapuram, JNKVV Jabalpur, to find out the most effective weed control method and sowing time for direct-seeded rice. The density (8.10 m^{-2}) and dry weight (9.05 gm^{-2}) of total weeds, plant height (58.82 cm), number of tillers (75.00 m^{-1} row length), plant dry weight (226.00 g m^{-2}) and grain yield (3.6 t/ha)was maximum in case of 20th June sowing over delayed sowing done on 5th and 20th July. Among all herbicidal treatment, Bispyribac sodium 25 g a.i. ha^{-1} was found significantly superior in reducing total weed density (6.17 m^{-2}) and total weed dry weight (8.38 g m^{-2}) and recorded the maximum weed control efficiency (69.89%).Similarly, the Bispyribac sodium 25 g a.i. ha^{-1} as post-emergence recorded significantly higher plant height, (62.71cm) number of tillers (85.76 m^{-1} row length), plant dry weight (242.00 g m^{-2}) and grain yield (3416 kg ha^{-1}) over rest of the treatments but found at par with two hand weeding.

Keywords: Direct-seeded rice, date of sowing, weed management, economics

Introduction
Transplanting of rice is an age-old practice but in recent years, non-availability of labors in the nick of time for transplanting leads to reduction in yield of rice (Budhar and Tamilselvan 2002) [2]. Though, direct seeded rice (DSR) yield is comparable with transplanted crop, increased weed infestation is major drawback of this system. Success of DSR depends largely on effective weed control. The yield loss in DSR due to weeds as high as 67.4-70.4% (Kumar *et al.*, 2010) [6]. Though the hand weeding has been found effective, yet it is very expensive due to heavy demand of labour during peak period and their scarcity necessitates the use of alternative methods of weed control. Chemical weed control being cost-effective and less labour dependent is recommended to overcome this constraint under DSR. Broad-spectrum weed control may not be possible by herbicide alone, as 5-6 flushes of weeds come up at different time intervals. Sowing time is a non-monetary input, but greatly affects the productivity of rice. Several studies have shown that sowing of rice after onset of monsoon gave higher grain yield. However, very late sowing could reduce the vegetative and reproductive growth period of rice, resulting into lower crop yield. Hence, the present investigation was under taken to study the effectiveness of date of sowing and weed management practices in managing weeds in direct seeded rice.

Materials and Methods
A field experiment was conducted during Kharif 2019 and 2020 at Zonal Agricultural Research station Powarkheda, Narmadapuram, JNKVV Jabalpur, to study the effect of various weed management practices and different sowing time on yield of direct seeded rice. A field experiment, consisted of 15 treatments, (3 sowing times as main plot treatments and 5 weed control treatments as sub plot treatments), were laid out in split plot design, with three replication. The soil of experimental field was deep black, medium in organic carbon (0.60%), available phosphorus (16.65 kg/ha) and potassium (463.0 kg/ha), with neutral pH (7.45). Rice variety of PS 4 was sown in rows at spacing of 20 cm the seed rate of 70 kg/ha with. The crop was fertilized with i.e.120 kg N, 60 kg P_2O_5 and 40 kg K_2O/ha through urea, single super phosphate and muriate of potash respectively. The half dose of N, entire dose of P_2O_5 and K_2O was applied as basal. Remaining half dose of nitrogen was applied in 2 equal splits at tillering and panicles initiation stage during both the years. The density of weeds was recorded at 60 DAS by placing a quadrat of 0.25 m^{-2} randomly at four places in each plot. Square root transformation of weed counts was done to normalize the weed data before analysis.

Biomass was determined after oven drying at 60 °C till constant weight is achieved. The weed control efficiency was calculated using the formula.

Results and Discussion

Effect on weed dynamics

The total density and dry weight of weeds were affected by sowing times. Both the weed indices were having the maximum values (8.10 m^{-2} and 9.05 g m^{-2}), when direct seeding of rice was done on 20th June over delayed sowing of direct seeded rice done on 5th July (7.62 m^{-2}& 8.93 g m^{-2}) and 20th July (6.94 m^{-2} and 8.84 g m^{-2}). The optimal soil conditions (Oxygen, temperature and moisture) could be assigned the reason for maximum density and dry weight of total weeds. Whereas, reverse was true in case of delayed sowing in the month of July especially low oxygen pressure in the rhizosphere. Similar views also been endorsed by Satapathy *et al*., 2021 [10] and Kumar *et al.*, 2012 [11].

The total density (10.52 m^{-2}) and dry weight (14.33 g m^{-2}) of weeds were maximum in weedy check plots due to uninterrupted growth of weeds throughout the growing season. However, both the weed indices were reduced appreciably when weed control was done chemically and mechanically. The total weed density and their dry weight were arrested markedly with the pre emergence application of Butachlor 1 kg ha^{-1} (8.42 m^{-2} and 9.18 g m^{-2}), sequentially application of Butachlor 1 kg ha^{-1} fb Fenoxyprop p- ethyl 100 g a.i. ha^{-1} (7.18 m^{-2} and 8.90 g m^{-2}) being the higher under early post emergence application of Bispyribac sodium 25 g a.i. ha^{-1} (6.17 m^{-2} and 8.38 g m^{-2}). This is attributed to broad-spectrum control of weeds under later treatment as compared to former weed control treatments. However, the later treatment did not surpass the hand weeding twice (20 and 40 DAS) as it had the lowest density and dry weight of weeds due to elimination of all cost of weeds during hand weeding at 20 and 40 DAS. Similar views have also been observed by Verma *et al*. (2022) [8] and Bahar & Singh, (2004) [3].

Effect on yield attributes

The plant height, number of tillers and plant dry weight were affected by sowing times. At 60 DAS, these yield attributing indices were having the maximum values (Table 2), when direct seeding of rice was done on 20th June over delayed sowing of direct seeded rice done on 5th and 20th July. The optimal soil conditions coupled with more time for completion of different phenophases could be assigned the reason for maximum plant height, number of tillers and plant dry weight. Whereas, reverse was true in case of delayed sowing in the month of July. These results were in conformity with the findings of Dawadi and Chaudhary (2013) [4]. They observed that rice crop sown on early date produced significantly higher plant height, higher number of tiller/m^2, leaves/tiller, leaf area index and total dry matter as compared to the sowing of crop on the later dates. Similar results were also observed by Akbar *et al.*, (2010) [1]. They reported that total number of productive tillers gradually decreased as the sowing was delayed after 20thJune

Different weed control treatments also caused marked variation on yield attributes. The plant height, number of tillers and plant dry weight were maximum under Bispyribac sodium 25 g a.i. ha^{-1} (62.71 cm, 85.76 m^{-1} row length and 242.00 g m^{-2}), to that of hand weeding twice (63.10 cm, 86.56 m^{-1} row length and 260.00 gm^{-2}), may probably due to stress free environment gives better weed control of weeds resulting in improvement in all growth parameters (plant height, number of tillers and plant dry weight). These results are in conformity with Ramachandiran & Balasubramanian (2012) [7] and Verma *et al*., (2022) [8]. They found that the post emergence application of Bispyribac sodium @ 25 g ha^{-1}, recorded higher number of tillers per m^2, number of panicles per m^2, number of filled grains per panicle in case of aerobic rice. However, it was significantly reduced in plots receiving Butachlor 1kg a.i. ha^{-1} *fb* fenoxyprop p- ethyl 100 g a.i. ha^{-1} (59.55 cm, 81.18 m^{-1} row length and 222.00 g m^{-2}), Butachlor 1 kg a.i. ha^{-1} (56.42 cm, 66.11 m^{-1} row length and 208.00 g m^{-2}), the minimum plant height, number of tillers and plant dry weight were recorded in incase of weedy check plot (39.52 cm, 34.85 m^{-1} row length and 128.00 g m^{-2}) due to severe competition for growth resources.

Effect on Grain yield

It is obvious from two year mean yield data that, grain yield was maximum in case of 20th June sowing (3508 kg ha^{-1}). However, it was reduced in plots, where sowing was done on 5th July (3142 kg ha^{-1}) and 20th July (1964 kg ha^{-1}). The superior values of yield attributing characters could be assigned the reason for maximum grain yield. Whereas, reverse was true in case of delayed sowing in the month of July as the poor values of yield attributing traits were there in case of later treatments, which caused 10.4% and 37.4% reduction in grain yield. Due to delayed sowing of direct seeded rice from 20 June to July 5 and 20 July. These results are in conformity with the findings of Kumar *et al*., 2010 [6].

Different weed control treatments caused marked influence on grain of direct seeded rice. The maximum grain yield was obtained under post emergence application of Bispyribac sodium 25 g a.i. ha^{-1} (3416 kg ha^{-1}) over Butachlor 1 kg a.i. ha^{-1} (2165 kg ha^{-1}), Butachlor 1kg a.i. ha^{-1} *fb* fenoxyprop p-ethyl 100 g a.i. ha^{-1} (3275 kg ha^{-1}) due to superior values of yield attributing traits. But the former treatment did not surpass hand weeding twice (3755 kg ha^{-1}) due to excellent values of yield attributes under cent per cent weed free condition. However, weedy check plots had maximum grain yield due to inferior values of yield attributing traits. Similar findings have been reposted by Ramachandiran and Balasubramanian (2012) [7].

Table 1: Effect of treatments on density and dry weight of total weeds at 60 days after sowing (mean of two years 2019 and 2020)

Treatments	Rate of application (kg/ha)	Time of Application (DAS)	Density of weeds (no. m^{-2})			Weed dry weight (g m^{-2})			WCE (%)		
			2019	2020	Mean	2019	2020	Mean	2019	2020	Mean
D_1: Early sowing (20th June)	-	-	7.88 (64.73)	8.33 (71.63)	8.10 (68.18)	9.11 (93.46)	8.99 (91.31)	9.05 (92.39)	54.42	54.75	54.58
D_2: Timely sowing (05th July)	-	-	7.42 (58.20)	7.82 (63.50)	7.62 (60.85)	9.00 (91.37)	8.85 (88.63)	8.93 (90.00)	54.81	55.31	55.06
D_3: Late sowing (20th July)	-	-	6.78 (49.07)	7.10 (53.30)	6.94 (51.28)	8.95 (90.75)	8.74 (86.89)	8.84 (88.82)	55.47	56.16	55.81
SEm (+)	-	-	0.054	0.031	0.041	0.01	0.01	0.01	0.20	0.21	0.20
CD (5%)	-	-	0.211	0.114	0.161	0.04	0.05	0.05	0.79	0.82	0.79
T_1: Butachlor PE	1	1	8.27 (68.11)	8.57 (73.33)	8.42 (70.72)	9.27 (85.39)	9.09 (82.22)	9.18 (83.81)	59.25	60.08	59.67
T_2: Butachlor PE fb fenoxyprop p- ethyle POE	1.0+0.1	1+25	6.99 (48.67)	7.36 (54.06)	7.18 (51.36)	8.99 (80.40)	8.81 (77.09)	8.90 (78.74)	61.70	62.12	61.91
T_3: Bispyribac sodium early POE	0.025	25	5.91 (34.78)	6.43 (41.22)	6.17 (38.00)	8.48 (71.41)	8.28 (68.11)	8.38 (69.76)	65.97	66.45	69.89
T_4: Hand weeding (20 and 40 DAS)	-	20+40	5.19 (26.67)	5.78 (33.22)	5.49 (29.94)	3.97 (15.30)	3.87 (14.46)	3.92 (14.88)	87.57	88.36	84.29
T_5: Weedy check	-	-	10.43 (108.44)	10.61 (112.22)	10.52 (110.33)	14.40 (206.81)	14.26 (202.84)	14.33 (204.83)	0.00	0.00	0.00
SEm (+)	0	0	0.057	0.081	0.063	0.03	0.04	0.04	0.26	0.26	0.23
CD (5%)	0	0	0.165	0.237	0.184	0.10	0.13	0.11	0.77	0.75	0.67

Original values are given in parentheses and transformed values are given in non-parenthesis

Table 2: Effect of treatments on growth and yield of direct seeded rice (mean of two years 2019 and 2020)

Treatments	Rate of application (kg/ha)	Time of Application (DAS)	Plant height (cm) at 60 DAS			No. of tillers m^{-1} row length at 60 DAS			Crop dry weight (g m^2) at 60 DAS			Grain yield (kg ha^{-1})		
			2019	2020	Mean	2019	2020	Mean	2019	2020	Mean	2019	2020	Mean
D_1: Early sowing (20th June)	-	-	60.09	57.55	58.82	77.55	72.45	75.00	219	233	226	3582	3434	3508
D_2: Timely sowing (05th July)	-	-	57.28	55.43	56.36	72.79	67.69	70.24	212	225	219	3206	3078	3142
D_3: Late sowing (20th July)	-	-	0.22	0.25	0.22	69.98	64.88	67.43	187	195	191	2103	1825	1964
SEm (+)	-	-	0.86	0.99	0.86	0.27	0.27	0.27	2.14	2.57	2.36	82.9	79.4	81.2
CD (5%)	-	-	57.42	55.42	57.42	1.06	1.06	1.06	8.41	10.09	9.25	325.6	311.8	318.7
T_1: Butachlor PE	1	1	57.42	55.42	56.42	68.66	63.56	66.11	202	213	208	2232	2099	2165
T_2: Butachlor PE fb fenoxyprop p-ethyle POE	1.0+0.1	1+25	60.91	58.20	59.55	83.73	78.63	81.18	216	229	222	3314	3201	3257
T_3: Bispyribac sodium early POE	0.025	25	63.89	61.53	62.71	88.31	83.21	85.76	234	250	242	3564	3267	3416
T_4: Hand weeding (20 and 40 DAS)	-	20+40	64.11	62.09	63.10	89.11	84.01	86.56	250	270	260	3889	3622	3755
T_5: Weedy check	-	-	40.44	38.60	39.52	37.40	32.30	34.85	130	126	128	1818	1706	1762
SEm (+)	0	0	0.35	0.53	0.31	0.31	0.31	0.31	2.65	3.18	2.91	121.67	116.8	107.1
CD (5%)	0	0	1.03	1.54	0.91	0.91	0.91	0.91	7.73	9.28	8.51	355.12	341.1	312.7

Conclusion

On the basis of two years study, it was concluded that sowing of direct-seeded rice in 20th June and post-emergence application of bispyribac sodium 25 g a.i. ha^{-1} provided effective control of weeds and found more productive.

References

1. Akbar N, Iqbal A, Khan HZ, Hanif MK, Bashir MU. Effect of different sowing dates on the yield and yield components of direct seeded fine rice (*Oryza sativa* L.) J Plant Breed. Crop Sci. 2010;2(10):312-315
2. Budhar MN, Tamilselvan N. Effect of stand establishment techniques on yield and economical low land irrigated rice. Indian Journal of Agronomy. 2002;47(1):57-60.
3. Bahar FA, Singh G. Effect of herbicides on dry seeded rice and associated weeds. Indian Journal of Weed Science. 2004;36(3&4):269-270.
4. Dawadi KP, Chaudhary NK. Effect of sowing dates and varieties on yield and yield attributes of direct seeded rice in Chitwan, Nepal. International J Agric. Res. Sci. 2013;2(4):095-102
5. Kumar J, Singh D, Puniya P, Pandey PC. Effect of weed management practices on nutrient uptake by direct seeded rice. Oryza. 2010a;47(4):291-294.
6. Kumar J, Singh D, Puniya P, Pandey PC. Effect of weed management practices on nutrient uptake by direct seeded rice. Oryza. 2010;47(4):291-294.
7. Ramachandiran K, Balasubramanian R. Effect of weed management on growth, yield attributes and yield of aerobic rice. Madras Agric. J. 2012;99(1-3):96-98
8. Verma B, Bhan M, Jha AK, Khatoon S, Raghuwanshi M, Bhayal L, *et al*. Weeds of direct-seeded rice influenced by herbicide mixture. Pharma Innovation. 2022;11(2):1080-1082.
9. Verma B, Bhan M, Jha AK, Singh V, Patel R, Sahu MP, *et al*. Weed management in direct-seeded rice through herbicidal mixtures under diverse agro ecosystems. AMA, Agricultural Mechanization in Asia, Africa and Latin America 53(4):7299-7306.

10. Satapathy BS, Duary Buddhadeb, Saha Sanjoy Munda, Sushil Chatterjee Dibyendu. Impact of sowing methods and weed control practices on yield and economics of wet direct seeded rice. ORYZA- An International Journal on Rice. 2021;58(3):375-383.
11. Kumar Jitendra Singh, Dheer Singh, Brijpal Singh, Rohitashav Panwar Suman, Gupta Atul Kumar. Sowing time and weed management practices to enhance yield of direct-seeded rice. Indian Journal of Weed Science. 2012;44(4):207209.