Short communication

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Integrated weed management in dry-seeded rice

Zahoor Ahmad Ganie*, Samar Singh and Samunder Singh

Department of Agronomy, CCS Haryana Agricultural University, Hisar, Haryana, 125 004

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Rice is the major *Kharif* crop of India covering 42.8 million ha area and amounting to 85.7 million tonnes of production (Anonymous 2012). The conventional system of rice production *i.e*. transplanting under puddled conditions (CT-TPR) is mainly followed by farmers. However, it is water, labour, and energy intensive, besides adversely affecting the environment. Therefore, to assure sustainability of rice production, more resource efficient alternative methods of rice cultivation are needed. For this reason, dry-seeded rice (DSR) technology being water, labour, energy efficient, and having eco-friendly characteristics, received much attention, and is emerging as a potential alternative to CT-TPR (Kumar and Ladha 2011). However, weed control is major limitation for the success of DSR (Chauhan and Yadav 2013). Aerobic systems are sub ject to much higher weed pressure than CT-TPR (Rao *et al.* 2007) in which weeds are suppressed by standing water, and transplanted rice seedlings, which have a''head start'' over germinating weed seedlings. Therefore, the present investigation was undertaken to find out suitable weed management practices in DSR. The hypothesis was that sequential application of pre-emergence (PRE) herbicides and post-emergence (POE) herbicides followed by (*fb*) handweeding (HW) will provide a season long weed control in DSR.

A field experiment was conducted during the *Kharif* season of 2011 at Chaudhary Charan Singh Haryana Agricultural University, Regional Research Station, Karnal, India. The soil of experimental plot was clay loam in texture, with slight alkaline reaction (pH 8.2), medium organic carbon (0.40%), low available nitrogen (115 kg/ha), and medium available phosphorus (9 kg P/ha), and potassium (112 kg K/ha). The experiment was laid out in split-plot design with three replications. The treatments comprised of four seed rates,*viz*.10, 17.5, 25 and 32.5 kg/ha which were assigned to main plots,and five weed control methods,*viz*. weedy check (W_1), weed free (W_2), pendimethalin 1.0 kg/ha as pre-emergence (PE) *fb* bispyribac-sodium 25 g/ha +ready-mixchlorimuron +metsulfuron 4 g/ha as post-emergence (POE) at 30 days after sowing (DAS) *fb* one HW 60 DAS (W_3), pendimethalin 1.0 kg/ha PE *fb* cyhalofop 200 g/ha POE 30 DAS *fb* ready-mix chlorimuron + metsulfuron 4 g/ha 35 DAS *fb* one HW 60 DAS (W_4) and pendimethalin 1.0 kg/ha PE *fb* fenoxaprop 60 g/ha POE 30 DAS *fb* ready-mixchlorimuron + metsulfuron 4 g/ha 35 DAS *fb* one HW 60 DAS (W_5) were allotted to sub-plots. Basmati rice variety *'CSR –30'* was seeded on 10th June 2011 under dry condition in rows 20 cm apart using limit-plot seed drill. The herbicides were sprayed uniformly with Knapsack sprayer fitted with flat fan nozzle calibrated to deliver 500 l/ha water volume. Species-wise weed density (no./m^2) and weed biomass (g/m^2) were recorded by putting a quadrat (0.25 m^2) at three random spots in each plot at 30, 60, 90 and 120 DAS. Data on weed density and biomass of weeds were transformed using square-root transformation ($\sqrt{x+0.5}$) before statistical analysis and weed control efficiency (WCE) was calculated on the basis of weed biomass.

***Corresponding author:** zahoorganie11@huskers.unl.edu

Effect on weeds

The weed flora observed in the experimental field included *Echinochloa colona, E. glabrescens, Leptochloa chinensis, Dactyloctenium aegyptium, Cyperus iria, C. difformis, Fimbristylis miliacea, Eclipta alba, Ammania baccifera, Digera arvensis, Lindernia crustacean,* and *Mazus pumilus.* All the weed control treatments significantly reduced the weed density and biomass over weedy check. Among the weed control methods, W_3 (PE application of pendimethalin 1.0 kg/ha *fb* bispyribac 25 g/ha + ready-mix chlorimuron + metsulfuron 4 g/ha at 30 DAS *fb* one HW at 60 DAS), recorded significantly lower weed density, weed biomass and higher WCE of 82% at 60 DAS compared to other treatments (Table 1). Pre-emergence application of pendimethalin controlled only grasses, few broad-leaf weeds but not sedges, as also reported by Yaduraju and Mishra (2004). Whereas POE of bispyribac-sodium 25 g/ha 30 DAS effectively controlled all three types of weeds *i.e*., grasses, broad-leaved and sedges. These findings are in conformity with Brar and Bhullar (2012).

Table 1. Effect of treatments on total weed density, weed biomass, WCE and rice grain yield at different stages of rice crop growth

Treatment	Stages of rice crop growth (DAS)				Weed control efficiency (WCE)	Grain yield (t/ha)
	Weed density (no./m^2)		Weed biomass (g/m^2)			
	60	120	60	120	60	
Seed rate (kg/ha)						
S_1	15.14 (317.8)	7.30 (109.2)	13.90(293)	8.70(178)	66.5	1.57
S_2	13.70 (258.1)	6.23 (77.3)	12.30 (218)	7.20 (116)	66.3	2.14
S_3	12.32 (208.0)	5.50 (58.2)	11.10 (184)	6.30 (85)	65.8	2.24
S_4	11.30 (174.9)	4.73 (42.3)	10.00 (148)	5.40 (61)	66.2	2.27
LSD (P=0.05)	0.14	0.12	0.19	0.09	NS	0.16
Weed control						
W_1	26.50 (711.0)	17.70 (321.1)	26.90 (734)	22 (507)	0	0.28
W_2	1.00 (0.0)	1.00 (0.0)	1.00 (0)	1.00 (0)	100.0	2.73
W_3	11.31 (130.1)	3.60 (12.0)	9.10 (85.00)	3.70 (13)	81.9	2.63
W_4	13.10 (147.1)	3.60 (12.1)	10.80 (108)	3.80 (14)	75.6	2.48
W_5	13.61 (185.4)	3.70 (13.6)	11.30 (128)	3.90 (15)	73.4	2.16
LSD (P=0.05)	0.12	0.18	0.22	0.38	0.4	0.14

*Original values are in parentheses and before statistical analysis were subjected to square root transformation $(\sqrt{x+1})$

The increase in seed rate also resulted in a significant decrease in the total weed density and total weed biomass at all the stages of crop growth (Table 1). With increase in seed rate the number of crop plants per unit area was higher, giving them competitive advantage over existing weeds. These findings are in agreement with the reports of Gill (2008). The treatment combinations of W_3 with all the seed rates resulted in highest WCE compared to all other treatment combinations and highest WCE was recorded with W_3S_4.

Effect on rice

All weed control treatments resulted in significantly higher rice grain yield than weedy check. Rice crop growth and yield contributing characters were affected adversely due to weedy condition which resulted in 90% loss of rice grain yield. The rice grain yield produced with pendimethalin 1.0 kg/ha pre-emergence (PE) *fb* bispyribac-sodium 25 g/ha + ready-mix chlorimuron + metsulfuron 4 g/ha post-emergence (POE) at 30 DAS *fb* one hand weeding (HW) 60 DAS treatment was statistically at par with that of weed free treatment. Among treatment combinations, pendimethalin 1.0 kg/ha pre-emergence (PE) *fb* bispyribac-sodium 25 g/ha + ready-mix chlorimuron + metsulfuron 4 g/ha post-emergence (POE) at 30 DAS *fb* one hand weeding (HW) 60 DAS with all rice seed rates (10, 17.5, 25 and 32.5 kg/ha) produced more grain yield as compared to other treatment combinations. However, with increment in seed rate beyond 17.5 kg/ha with all weed control methods did not increase the grain yield significantly. The increase in rice grain yield over weedy check due to different treatments was attributed to the reduced density and biomass of weeds at all stages of crop growth, which resulted in increased dry matter production of rice, number of panicles per square metre, number of grains per panicle and 1000 grain weight.

SUMMARY

The present study revealed that weeds cause a rice yield loss of about 90% in dry-seeded rice and the integrated approach to control weeds based on PE application of pendimethalin 1.0 kg/ha *fb* POE bispyribac-sodium 25 g/ha + ready-mix chlorimuron + metsulfuron 4 g/ha 30 DAS *fb* one HW 60 DAS was found to be best with WCE of 82%. Increase in rice seed rate from 10 to 32.5 kg/ha resulted in decrease in weed density and weed biomass but the rice yield increase beyond 17.5 kg/ha seed rate was non-significant. Therefore, rice seed rate of 17.5 kg/ha was found optimum for DSR, however it needs further investigation and confirmation.

REFERENCES

Anonymous.2012.India.gov.in/sectors/agriculture/area production yield/rice-2012.

Brar HS and Bhullar MS. 2012. Dry-seeded rice productivity in relation to sowing-time, variety and weed control. *Indian Journal of Weed Science* **44**(3): 193-195.

Chauhan BS and Yadav A. 2013. Weed management approaches for direct-seeded rice in India: a review. *Indian Journal of Weed Science* **45**(1): 1-6.

Gill MS. 2008. Productivity of direct-seeded rice (*Oryza sativa*) under varying seed rates, weed control and irrigation levels. *Indian Journal of Agricultural Science* **78**: 766-770.

Kumar V and Ladha JK. 2011. Direct seeded rice: Recent development and future research needs. *Advances in Agronomy* **111**: 297-413.

Rao AN, Johnson DE, Shivprasad B, Ladha JK and Mortimer AM. 2007. Weed management in direct-seeded rice. *Advances in Agronomy* **93**: 153-255.

Yaduraju NT and Mishra JS. 2004. Weed management in rice with special orientation to export. pp. 111-115. In: *SAARC RICE EXPO 2004*, Maharashtra Chamber of Commerce and Industry and Rice Exporters Association of Pakistan, Mumbai, India.