



Evaluation of bispyribac-sodium in transplanted rice

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ABSTRACT

Field experiments were conducted at Agricultural College and Research Institute, Tamil Nadu Agricultural University, Madurai to evaluate herbicide bispyribac-sodium in transplanted rice varieties 'ASD 16' and 'ADT 37' during 2010 and 2011. Seven treatments were included in a randomized block design and replicated four times. The treatments consisted of pre-emergence application of butachlor 500 g/ha, post-emergence application of bispyribac-sodium 10 SC at 25, 35 and 50 g/ha, weed free, hand weeding twice and unweeded check. The results revealed that total weed population and dry weight under bispyribac-sodium at 25 g/ha were at par with the higher doses of bispyribac-sodium at 35 and 50 g/ha during both the years of study. The weed control efficiency and weed index under bispyribac-sodium at lower dose were also comparable with that of higher doses indicating the sufficiency of bispyribac-sodium at 25 g/ha for effective weed management in transplanted rice. The effect of bispyribac-sodium at 25 g/ha on producing tillers and panicles was also at par with that of higher doses and twice hand weeding and significantly superior than butachlor application. Post-emergence application of bispyribac-sodium at 25 g/ha recorded a grain yield of 6.84 and 6.51 t/ha during 2010 and 2011, respectively which were at par with higher doses of bispyribac-sodium, twice hand weeding and weed free and significantly higher than butachlor application. Higher net income and benefit-cost ratio were also associated with the application of bispyribac-sodium at 25 g/ha.

Key words: Bispyribac-sodium, Economics, Grain yield, Rice, Weed

Rice, the most important staple food crop of India is cultivated under various ecosystems, viz. transplanted, direct sown and rainfed situations. To meet the future food requirements of ever increasing population and maintain self sufficiency, the estimated rice production in India should be 350 million tonnes by 2020 AD. In transplanted rice, weed infestations not only reduce the grain yield up to 45% but also quality of grain is impaired. The share of weed management cost is higher than other operations in transplanted rice. Though many pre-emergence herbicides are available for controlling weeds, the need for post-emergence herbicide is often realized to combat the weeds emerged during later stages of crop growth. More over, due to increasing problem of labour availability for rice cultivation, use of post-emergence herbicide has greater potential for effective weed management and higher yield. In this context, present study was carried out to evaluate bispyribac-sodium efficacy in transplanted rice.

MATERIALS AND METHODS

Field experiments were conducted at Agricultural College and Research Institute, Tamil Nadu Agricultural

University, Madurai to evaluate herbicide bispyribac-sodium in transplanted rice on growth, yield and weed control efficiency in transplanted rice during *Kharif* 2010 and 2011. A total of seven treatments was evaluated in a randomized block design and replicated four times. The treatments consisted of pre-emergence application of butachlor 1500 g/ha at 0-5 days after transplanting (DAT), post-emergence application of bispyribac-sodium 10 SC at 25, 35, 50 g/ha at 20 DAT, weed free, two hand weeding and weedy check. The soil of the experimental field was clay loam with a pH of 6.8 and having NPK status of low, medium and high respectively. The rice varieties 'ASD 16' and 'ADT 37' were used during 2010 and 2011, respectively with a spacing of 20 x 10 cm. Bispyribac-sodium was applied as foliar spray on 20 DAT in the respective treatments as per schedule while butachlor was applied as broadcasting with sand mixing. Hand weeding was carried out on 20 and 40 DAT and for weed free plot, hand weeding was done as and when required. The data on weed density and dry weight of weeds were recorded at 45 DAT. The weed dry weight was expressed as kg/ha. Weed control efficiency and weed index were computed. The yield attributes and grain yield of rice were recorded and economics was also worked out.

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RESULTS AND DISCUSSION

Total weed density

The total density of weeds decreased with increase in doses of bispyribac-sodium but not significantly (Table 1). The lowest total weed density was observed by weed free plots. However, this was statistically similar with application of all the doses of bispyribac-sodium during both the years. The total weed density under the treatments butachlor application at 1500 g/ha and hand weeding twice were similar and significantly higher than all the doses of bispyribac-sodium. The highest weed density was observed in unweeded control plot. Reduction in weed density due to application of bispyribac-sodium at 15 and 25 DAT in transplanted rice were reported by Yadav *et al.* (2009). Similar effective control of grasses, sedges and broad-leaved weeds in rice fields was documented by Schmidt *et al.*, (1999). These results were also in conformity with the findings of Kumaran *et al.* (2012) who registered lower weed density under bispyribac-sodium than other weed management treatments in direct-seeded rice.

Dry weight

Application of bispyribac-sodium at all the doses resulted in significant reduction in total weed dry weight than butachlor application, twice hand weeding and unweeded check (Table 1). However the total weed dry weight under the higher dose of bispyribac-sodium at 50 g/ha was at par with the lower doses of 25 and 35 g/ha indicating the sufficiency of lower dose of 25 g/ha for effective weed management in transplanted rice in both the years. The weed controlling effect of pre-emergence application of butachlor and two hand weeding was lesser than bispyribac-sodium as evident from significantly higher

weed dry weight under above two treatments. The highest weed dry weight was registered in unweeded control plot. Post-emergence application of bispyribac-sodium at 15 or 25 DAT significantly decreased the weed dry weight in transplanted rice (Yadav *et al.* 2009). Similar results of lower weed dry weight with the application of bispyribac-sodium at 40 g/ha than butachlor and anilophos in transplanted rice was recorded by Nalini *et al.* (2012). The significant reduction of weed dry weight by bispyribac-sodium at 30 g/ha than pre-emergence herbicide application in dry-seeded rice was also observed by Walia *et al.* (2008).

Weed control efficiency

Among the weed control treatments, application of bispyribac-sodium at 50 g/ha recorded highest weed control efficiency of 98.1 and 98.5% during 2010 and 2011, respectively (Table 1), which was followed by the same herbicide with lower doses of 35 g/ha (97.5 and 97.8%) and 25 g/ha (96.5 and 97.1%) during 2010 and 2011 respectively. The weed control efficiency under hand weeding twice and application of butachlor at 1500 g/ha were lesser than that of all the doses of bispyribac-sodium during both the years. Weed index which indicate the reduction in grain yield was minimum under bispyribac-sodium applied plots. Post-emergence application of bispyribac-sodium at all the doses reduced the grain yield very marginally indicating the superior effect of weed control. Higher weed control efficiency with lower weed index under bispyribac-sodium applied plots were due to effective weed control as evident from lower weed population and lesser weed dry weight than other treatments. Similar result of bispyribac-sodium was registered by Yun *et al.* (2005) and Nalini *et al.* (2012).

Table 1. Effect of bispyribac-sodium on weed growth in transplanted rice

Treatment	Total weed density at 45 DAT (no./m ²)		Total weed DMP (kg/ha)		Weed control efficiency (%)		Weed index	
	2010	2011	2010	2011	2010	2011	2010	2011
Butachlor 1500 g/ha	4.75 (2.29)	33.00 (5.79)	356 (25.09)	307 (17.54)	92.1	91.3	11.23	13.70
Bispyribac-sodium 25 g/ha	1.50 (1.41)	12.00 (3.54)	159 (16.69)	105 (10.27)	96.5	97.1	4.21	4.64
Bispyribac-sodium 35 g/ha	1.25 (1.32)	7.67 (2.86)	112 (14.10)	76 (8.75)	97.5	97.8	3.57	2.99
Bispyribac-sodium 50 g/ha	0.75 (1.11)	5.32 (2.32)	87 (12.38)	53 (7.31)	98.1	98.5	1.75	0.35
Weed-free	0.00 (0.71)	0.00 (0.71)	0 (0.71)	0 (0.71)	100.0	100.0	-	-
Two hand weedings	3.75 (2.06)	16.67 (4.14)	289 (22.62)	128 (11.34)	93.6	96.4	6.30	5.57
Unweeded check	63.75(8.02)	110.68 (10.54)	4511 (90.31)	3541 (59.51)	-	-	44.78	51.28
LSD (P=0.05)	0.28	12.00	3.89	81.60	-	-	-	-

Figures in parentheses are $\sqrt{x+0.5}$ transformed values

Yield attributes

All the yield attributes of rice were significantly influenced by the weed management practices (Table 2). Highest number of panicles/m² of 420 and 312 during 2010 and 2011, respectively were recorded by weed free plot which was at par with all the doses of bispyribac-sodium application. Application of bispyribac-sodium at 25 g/ha registered though numerically lower number of panicles/m², its effect on producing tillers was at par that of higher doses and twice hand weeding and significantly higher than butachlor application. Regarding panicle length, weed free plot though recorded higher values, it was at par with all the doses of bispyribac-sodium and hand weeding twice. Similarly, number of grains/panicle were also higher with weed free plot but at par with bispyribac-sodium at 50 g/ha. Post-emergence application of bispyribac-sodium at 25 g/ha registered 129 and 146 number of grains/panicle during 2010 and 2011, respectively which was at par with that of bispyribac-sodium at 50 g/ha (139 and 148) and twice hand weeding (136 and 145) and significantly higher than butachlor application (118 and 125). Similar results of higher yield attributes of transplanted rice under bispyribac-sodium application was reported by Yadav *et al.* (2009).

Grain yield

Significant variation among weed management practices was found and higher yield was associated with bispyribac-sodium applied plots (Table 2). Weed free plot registered highest grain yield of 7.14 and 6.93 t/ha during 2010 and 2011, respectively which was at par with all the doses of bispyribac-sodium. Post-emergence application of bispyribac-sodium at 25 g/ha recorded grain yield of

6.84 and 6.51 t/ha during 2010 and 2011, respectively which was at par with higher doses of bispyribac-sodium and significantly superior than butachlor application. The effect of all the three doses of bispyribac-sodium on grain yield was significantly higher than butachlor application and unweeded control. The per cent yield increment due to application of bispyribac-sodium at the rate of 25 g/ha were 7.9, 2.2 and 73.5 during 2010 and 0.8, 9.4 and 95.7% during 2011 than twice hand weeding, butachlor application and unweeded control, respectively. There was 44.8 and 51.3% yield reduction under unweeded plot over weed free plot during 2010 and 2011, respectively. The higher grain yield in bispyribac-sodium applied plots was attributed to lesser weed population and weed dry weight which might have caused lesser weed competition with rice resulted in the production of higher yield attributes which was reflected in higher yield. The results of effective weed control along with higher grain yield by bispyribac-sodium against mixed weed flora in transplanted rice (Yadav *et al.* 2009), wet-seeded rice (Yadav *et al.* 2007) and dry-seeded rice (Walia *et al.* 2008) were in confirmative with the present investigation. Murali *et al.* (2012) obtained similar grain yield of transplanted rice under bispyribac-sodium at both the doses of 50 and 35 g/ha.

Economics

The economic analysis of weed management practices (Table 2) revealed that higher economic benefits were realized under lower doses of bispyribac-sodium application. Post-emergence application of bispyribac-sodium at 25 g/ha registered highest net profit of ₹ 42,452 and ₹ 40,400/ha during 2010 and 2011, respectively followed by bispyribac-sodium at 50 g/ha (₹ 42,086 and ₹ 40,330/ha). Higher benefit-cost ratio was also associated with

Table 2. Effect of bispyribac-sodium application on yield and economics of transplanted rice

Treatment	No. of panicles/m ²		Panicle length (cm)		No. of grains/panicle		Grain yield (t/ha)		Net profit (x10 ³ ₹/ha)		Benefit: cost ratio	
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
Butachlor 1500 g/ha	380	271	22.6	22.9	118	125	6.34	5.89	38.74	34.72	2.81	2.43
Bispyribac-sodium 25 g/ha	404	297	23.6	24.0	129	146	6.84	6.51	42.45	40.40	2.89	2.61
Bispyribac-sodium 35 g/ha	408	299	24.0	24.2	139	148	6.88	6.62	42.09	40.23	2.81	2.54
Bispyribac-sodium 50 g/ha	415	304	24.3	24.3	142	153	7.01	6.70	42.25	40.33	2.73	2.51
Weed free	420	312	24.9	24.7	149	158	7.14	6.83	40.32	37.77	2.47	2.24
Two hand weeding	401	291	24.2	23.4	136	145	6.69	6.45	38.55	36.47	2.54	2.30
Unweeded check	257	130	18.8	18.1	95	92	3.94	3.33	15.48	10.26	1.78	1.45
LSD (P=0.05)	8.6	7.5	1.12	1.08	3.9	4.2	1.94	1.78	-	-	-	-

bispyribac-sodium at 25 g/ha (2.89 and 2.61) which was followed by bispyribac-sodium at 35 g/ha (2.81 and 2.54). Though higher dose of bispyribac-sodium at 50 g/ha recorded slightly higher grain yield, economically it was inferior to its lower dose of 25 g/ha.

It may be concluded that application of post-emergence herbicide bispyribac-sodium at the rate of 25 g/ha on 20 DAT could be a suitable and economical herbicidal weed management for transplanted rice and higher productivity.

REFERENCES

- Kumaran ST, Kathiresan G, Chinnusamy C and Murali Arthanari P. 2012. Evaluation of new post-emergence herbicide bispyribac-sodium for transplanted rice, p. 74. In: *Biennial Conference on Weed Threat to Agriculture, Biodiversity and Environment*, 19-20 April, 2012, Kerala Agricultural University, Thrissur, Kerala.
- Murali Arthanari P, Chinnusamy C, Gowthami S, Muthukrishnan P, Veeramani P and Nalini K. 2012. Evaluation of new post-emergence herbicide bispyribac-sodium for transplanted rice, p. 78. In: *Biennial Conference on Weed Threat to Agriculture, Biodiversity and Environment*, 19-20 April, 2012, Kerala Agricultural University, Thrissur, Kerala.
- Nalini K, Murali Arthanari P and Chinnusamy C. 2012. Evaluation of new post-emergence herbicide bispyribac-sodium for transplanted rice, p. 74. In: *Biennial Conference on Weed Threat to Agriculture, Biodiversity and Environment*, 19-20 April, 2012, Kerala Agricultural University, Thrissur, Kerala.
- Schmidt LA, Scherder EF, Wheeler CC, Rutledge JS, Talbert RE and Baldwin FL. 1999. Performance of V-10029 (bispyribac-sodium) in rice weed control programmes. *Proceedings of South Weed Science Society* **52**: 49–50.
- Yadav DB, Yadav A, Malik RK and Gill G. 2007. Efficacy of PIH 2023, penoxsulam and azimsulfuron for post-emergence weed control in wet direct-seeded rice, p. 92. In: *Proceedings of Biennial Conference on New and Emerging Issues in Weed Science*. CCS HAU, Hisar, 2-3 November.
- Yun MS, Yogo Y, Miura R, Yamasue Y and Fischer. 2005. Cytochrome P-450 monooxygenase activity in herbicide-resistant and susceptible late watergrass (*Echinochloa phyllopogon*). *Pesticide Biochemistry and Physiology* **83**:107–114.
- Yadav DB, Ashok Yadav and Punia SS. 2009. Evaluation of bispyribac-sodium for weed control in transplanted rice. *Indian Journal of Weed Science* **41**(1&2): 23-27.
- Walia US, Singh Onkar, Nayyar Shelly and Sindhu Vinay. 2008. Performance of post-emergence application of bispyribac in dry-seeded rice. *Indian Journal of Weed Science* **40**(3&4): 157–160.