

## Growth and yield of transplanted rice as influenced by application of bispyribac sodium 10 sc a post-emergence herbicide

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**ABSTRACT:** A field experiment was conducted to evaluate the bio-efficacy of the bispyribac sodium herbicide in transplanted rice during summer 2011 at Zonal Agricultural Research Station, V. C. Farm, Mandya, Karnataka. The experiment consisted of 11 treatments replicated thrice and were laid out in RCBD. The major weed flora observed in the experimental field were, *Cyperus difformis*, *Cyperus iria*, *Fimbristylis woodrowii*, *Echinochloa crus-galli*, *Cynodon dactylon*, *Rotala densiflora* and *Eclipta alba*. Application of bispyribac sodium 10% SC at 35 g a.i. ha<sup>-1</sup> at 15 DAT was found effective against all types of weeds and recorded higher weed control efficiency. However, application of bispyribac sodium 10 % SC at 25 g a.i. ha<sup>-1</sup> at 15 DAT recorded significantly higher grain and straw yield of 6474 and 7658 kg/ha, respectively with less Phytotoxicity and was being on par with two hand weedings at 20 and 40 DAT (6243 and 7492 kg/ha, respectively) as compared to weedy check (4102 and 4922 kg/ha, respectively).

**Keywords:** Bispyribac sodium, Hand weeding, Weed control efficiency, Weed flora,

### INTRODUCTION

Rice is an important staple food crop of India, contributes 45 per cent of total food grain production. Weed infestation in transplanted rice is a critical factor that reduces the yield to an extent of 15 to 45 per cent (Singh *et al.*, 2003). Manual weeding is very effective but it is tedious, time consuming and expensive in large scale cultivation. In such situation, chemical weed control is a better option as they can check weed growth from the early stage of crop growth. Pre-emergence herbicides such as butachlor, pretilachlor, Pyrazosulfuron ethyl, Bensulfuron methyl, Bensulfuron methyl + pretilachlor are being used frequently for the effective management of weeds in transplanted rice, but the window of their application is very narrow (1-5 DAT). The need of post emergence herbicides is often realized by the rice growers to combat weeds emerging during later stages of crop growth. This necessitate for initiating research efforts to evaluate and identify suitable post-emergence herbicides, which are effective in control of many annual and perennial grasses, sedges and broad leaved weeds in rice fields. Bispyribac sodium is a pyrimidinyl carboxy herbicide used as early post

emergent herbicide and is effective against many annual and perennial grasses, sedges and broad leaved weeds in rice fields (Schmidt *et al.*, 1999; Yun *et al.*, 2005). With this perspective the present study was undertaken to standardize its dose and time of application against complex weed flora in transplanted rice under Cauvery command area.

### MATERIAL AND METHODS

A field experiment was conducted during summer 2011, at Zonal Agricultural Research Station, V.C. Farm, Mandya, Karnataka to study the bio-efficacy of Bispyribac sodium on growth, yield and yield attributes of transplanted rice. The soil texture of the experimental field was red sandy loamy with low available nitrogen (274.6 kg/ha), medium in available phosphorus (27.2 kg/ha) and available potassium (174.3 kg/ha) with slightly acidic in reaction (pH 6.05). Experiment consisted of eleven treatments *viz.*, T<sub>1</sub>: Bispyribac sodium 10% SC at 10 g a.i. per ha at 15 DAT, T<sub>2</sub>: Bispyribac sodium 10% SC at 15 g a.i. per ha at 15 DAT, T<sub>3</sub>: Bispyribac sodium 10% SC at 20 g a.i. per ha at 15 DAT, T<sub>4</sub>: Bispyribac sodium 10 % SC at 25 g a.i. per ha at 15 DAT, T<sub>5</sub>: Bispyribac sodium 10%

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SC at 30 g a.i. per ha at 15 DAT, T<sub>6</sub>: Bispyribac sodium 10 % SC at 35 g a.i. per ha at 15 DAT, T<sub>7</sub>: Pretilachlor 50 % EC at 750 g a.i per ha at 5 DAT, T<sub>8</sub>: Bensulfuron methyl + Pretilachlor (at 10 kg/ha) at 8 DAT, T<sub>9</sub>: Two Hand weedings at 20 and 40 DAT, T<sub>10</sub>: Conoweeder passing at 20 and 40 DAT and T<sub>11</sub>: Unweeded check. The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. Twenty five days old seedlings (Jaya variety) were transplanted at a spacing of 20 cm x 10 cm. Crop was raised by as per the recommendation of state university (10 t/ha FYM and 125:62.5:62.5 kg NPK per ha). Bispyribac sodium was sprayed by Knapsack sprayer fitted with flat pan nozzle using 500 litres of water per hectare. The pre-emergence herbicides like pretilachlor and bensulfuron methyl+pretilachlor were applied at 3 and 8 DAT, respectively. Weed population and weed dry weight of weeds were recorded at 60 DAT and yield and yield components at maturity. The data on weed count and weed dry weight were subjected to square root transformation using the formula  $\sqrt{x+0.5}$  and analysis was done. The crop toxicity rating was done as per the European Weed Research Society (EWRS) classification scale as given below (Anon., 1981). Weed control efficiency (WCE) was calculated as per the standard formulae given by Sunil *et al.* (2010).

$$WCE(\%) = \frac{\text{Dry matter production of weeds in unweeded plot} - \text{Dry weight production of weeds in treated plots}}{\text{Dry matter of weeds in unweeded plot}} \times 100$$

## RESULTS AND DISCUSSION

### Effect on weed

The major weed flora observed in the experimental field in association with the transplanted rice were

*Cyperus difformis*, *Cyperus iria*, *Fimbristylis woodrowii* (among sedges); *Panicum repens*, *Echinochloa colona*, *Echinochloa crus-galli*, *Cynodon doctylon* (among grasses); *Rotala densiflora*, *Eclipta alba*, *Spilanthus calva*, *Portulaca quadrifida* (among broad leaved weeds).

The treatment receiving Bispyribac sodium at 35 g a.i. ha<sup>-1</sup> applied at 15 DAT recorded significantly lower weed population and weed dry weight at all the growth stages as compared to weedy check. However, it was on par with Bispyribac sodium at 30 and 25 g a.i. ha<sup>-1</sup> and two hand weedings at 20 and 40 DAT, respectively. As a result of this higher weed control efficiency was also observed with same treatment. The results were in conformity with the findings of Evelyn Javier and Fernando Garica, 2005 (Table 1).

### Studies on crop toxicity ratings

Crop toxicity ratings were recorded at 10, 20 and 30 days after spraying and application of bispyribac-sodium 10% SC at 35 g a.i. ha<sup>-1</sup> at 15 DAT showed yellowing of leaves and stunted growth of crop. Lower doses of Bispyribac-sodium 10% SC @ 10-25 g a.i. ha<sup>-1</sup> at 15 DAT did not cause any phytotoxicity symptoms on rice from initial stage suggesting quite safety of these doses in rice (Table 2).

### Effect on crop

A significant increase in grain yield was recorded with the application of bispyribac sodium 10% SC at 25 g a.i. per ha at 15 DAT and was being on par with bensulfuron methyl + pretilachlor (10 kg/ha) at 8 DAT. The higher yield in bispyribac sodium 10% SC at 25 g/ha treated plot may be attributed to more number of productive tillers per hill, higher panicle length, panicle weight, more number of filled grains per panicle and higher test weight (Table 4). In the similar way the higher yield parameters was a result

**Table 1**  
Effect of weed control treatments on weed population, dry weight (at 60 DAT) and weed index and weed control efficiency in transplanted rice

Treatments	Weed population (No. m <sup>-2</sup> )				Weed dry weight (g. 0.25 m <sup>-2</sup> )				WCE (%)
	Sedges	Grasses	BLW	Total	Sedges	Grasses	BLW	Total	
T <sub>1</sub>	4.67(21.33)	5.01(24.67)	5.07(25.67)	8.49(71.63)	2.42(5.39)	2.02(3.58)	2.33(4.93)	3.79(13.90)	48.68
T <sub>2</sub>	4.34(18.33)	4.84(23.0)	4.21(17.67)	7.68(59.06)	2.26(4.63)	1.95(3.29)	1.94(3.26)	3.41(11.18)	58.73
T <sub>3</sub>	3.71(13.33)	4.59(20.67)	3.92(15.33)	7.06(49.35)	1.99(3.48)	1.84(2.91)	1.92(3.17)	3.17(9.58)	64.63
T <sub>4</sub>	2.96(8.33)	3.72(13.33)	3.22(10.33)	5.71(32.07)	1.74(2.53)	1.59(2.03)	1.53(1.84)	2.63(6.40)	76.37
T <sub>5</sub>	2.85(7.67)	3.44(11.33)	3.04(9.33)	5.37(28.34)	1.59(2.04)	1.45(1.62)	1.47(1.68)	2.41(5.33)	80.32
T <sub>6</sub>	2.80(7.33)	3.16(9.67)	2.95(8.67)	5.12(25.68)	1.57(1.99)	1.31(1.24)	1.44(1.57)	2.30(4.82)	82.20
T <sub>7</sub>	4.22(17.33)	4.30(18.0)	4.09(16.67)	7.24(52.0)	2.12(4.03)	1.77(2.62)	1.93(3.21)	3.22(9.87)	63.56
T <sub>8</sub>	4.14(16.67)	3.97(13.33)	4.44(19.67)	7.08(49.66)	2.16(4.20)	1.53(1.84)	2.02(3.58)	3.18(9.62)	64.40
T <sub>9</sub>	3.03(8.67)	3.89(14.67)	3.36(11.33)	6.03(34.65)	1.78(2.67)	1.59(2.02)	1.56(1.97)	2.68(6.67)	75.37
T <sub>10</sub>	4.00(15.67)	4.81(22.67)	4.29(18.33)	7.56(56.65)	2.13(4.08)	1.90(3.11)	1.98(3.43)	3.33(10.61)	60.83
T <sub>11</sub>	7.40(54.33)	6.85(46.67)	5.60(31.33)	11.78(132.33)	4.05(15.97)	2.50(5.74)	2.42(5.36)	5.25(27.09)	-
LCD(P=0.05)	0.48	0.53	0.40	0.76	0.26	0.14	0.15	0.23	NA

Note: Values in the parenthesis are original values, BLW: broad leaved weeds, NA- not analysed, WCE: Weed control efficiency

**Table 2**  
Effect of weed management practices on crop toxicity ratings in transplanted rice

Treatments	10 DAS	20 DAS	30 DAS
T <sub>1</sub> : Bispyribac sodium 10 % SC at 10g a.i ha <sup>-1</sup> at 15 DAT	1.0	1.0	1.0
T <sub>2</sub> : Bispyribac sodium 10 % SC at 15g a.i ha <sup>-1</sup> at 15 DAT	1.0	1.0	1.0
T <sub>3</sub> : Bispyribac sodium 10 % SC at 20g a.i ha <sup>-1</sup> at 15 DAT	1.0	1.0	1.0
T <sub>4</sub> : Bispyribac sodium 10 % SC at 25g a.i ha <sup>-1</sup> at 15 DAT	1.0	1.0	1.0
T <sub>5</sub> : Bispyribac sodium 10 % SC at 30g a.i ha <sup>-1</sup> at 15 DAT	2.4	2.6	3.0
T <sub>6</sub> : Bispyribac sodium 10 % SC at 35g a.i ha <sup>-1</sup> at 15 DAT	2.6	3.2	3.4
T <sub>7</sub> : Pretilachlor 50 % EC at 750g a.i ha <sup>-1</sup> at 5 DAT	1.0	1.0	1.0
T <sub>8</sub> : Bensulfuron methyl + Pretilachlor (10 kg ha <sup>-1</sup> ) at 8 DAT	1.0	1.0	1.0
T <sub>9</sub> : Two Hand weeding at 20 and 40 DAT.	1.0	1.0	1.0
T <sub>10</sub> : Cono weeder at 20 and 40 DAT.	1.0	1.0	1.0
T <sub>11</sub> : Unweeded check.	1.0	1.0	1.0

Note: a.i.: active ingredient, DAS : Days after spraying DAT : Days after transplanting

**Table 3**  
Effect of weed control treatments on growth and yield parameters in transplanted rice

Treatments	Plant height (cm)	No. tillers per hill	Leaf area (cm <sup>2</sup> /hill)	Plant dry weight (g/hill)
T <sub>1</sub> : Bispyribac sodium 10 % SC at 10g a.i ha <sup>-1</sup> at 15 DAT	98.9	14.7	949	40.98
T <sub>2</sub> : Bispyribac sodium 10 % SC at 15g a.i ha <sup>-1</sup> at 15 DAT	98.8	15.8	972	41.62
T <sub>3</sub> : Bispyribac sodium 10 % SC at 20g a.i ha <sup>-1</sup> at 15 DAT	97.9	16.0	976	43.82
T <sub>4</sub> : Bispyribac sodium 10 % SC at 25g a.i ha <sup>-1</sup> at 15 DAT	102.3	17.8	1141	47.01
T <sub>5</sub> : Bispyribac sodium 10 % SC at 30g a.i ha <sup>-1</sup> at 15 DAT	100.5	14.7	947	41.44
T <sub>6</sub> : Bispyribac sodium 10 % SC at 35g a.i ha <sup>-1</sup> at 15 DAT	100.1	14.7	935	41.69
T <sub>7</sub> : Pretilachlor 50 % EC at 750g a.i ha <sup>-1</sup> at 5 DAT	98.5	15.7	923	42.42
T <sub>8</sub> : Bensulfuron methyl + Pretilachlor (10 kg/ha) at 8 DAT	98.6	15.9	940	42.77
T <sub>9</sub> : Two Hand weeding at 20 and 40 DAT.	101.0	17.1	1130	46.56
T <sub>10</sub> : Conoweeder at 20 and 40 DAT.	99.7	15.8	970	45.35
T <sub>11</sub> : Unweeded check	81.6	12.1	764	33.69
<b>LCD (P = 0.05)</b>	2.5	2.8	18.9	1.49

Note: DAT: days after transplanting, a.i.: active ingredient

**Table 4**  
Effect of weed control treatments on growth and yield parameters in transplanted rice

Treatments	Productive tillers per hill	Panicle length (cm)	Panicle weight (g)	Test weight (g)	Filled grains per panicle	Grain yield (kg/ha)	Straw yield (kg/ha)
T <sub>1</sub> : Bispyribac sodium 10 % SC at 10g a.i ha <sup>-1</sup> at 15 DAT	10.37	22.30	2.26	26.02	132	5060	6072
T <sub>2</sub> : Bispyribac sodium 10 % SC at 15g a.i ha <sup>-1</sup> at 15 DAT	10.44	22.44	2.32	26.09	135	5393	6471
T <sub>3</sub> : Bispyribac sodium 10 % SC at 20g a.i ha <sup>-1</sup> at 15 DAT	11.15	22.71	2.33	24.75	13	5699	6839
T <sub>4</sub> : Bispyribac sodium 10 % SC at 25g a.i ha <sup>-1</sup> at 15 DAT	12.57	24.98	2.64	26.65	160	6474	7658
T <sub>5</sub> : Bispyribac sodium 10 % SC at 30g a.i ha <sup>-1</sup> at 15 DAT	10.93	22.54	2.33	25.36	142	5451	6541
T <sub>6</sub> : Bispyribac sodium 10 % SC at 35g a.i ha <sup>-1</sup> at 15 DAT	10.90	22.52	2.34	25.37	141	5442	6530
T <sub>7</sub> : Pretilachlor 50 % EC at 750g a.i ha <sup>-1</sup> at 5 DAT	10.73	22.78	2.27	24.69	136	5108	6115
T <sub>8</sub> : Bensulfuron methyl + Pretilachlor (10 kg/ha) at 8 DAT	11.66	24.14	2.48	25.85	155.	5990	7232
T <sub>9</sub> : Two Hand weeding at 20 and 40 DAT	12.36	24.34	2.60	26.49	158	6243	7492
T <sub>10</sub> : Conoweeder at 20 and 40 DAT	10.84	23.25	2.42	25.84	138	5499	6599
T <sub>11</sub> : Unweeded check	8.87	19.03	1.93	21.79	119	4102	4922
<b>LCD (P = 0.05)</b>	1.04	2.03	0.19	1.53	5.68	376	420.27

Note: DAT: days after transplanting, a.i.: active ingredient

of higher growth parameters *viz.*, plant height, no. of tillers per hill, leaf area and plant dry weight (Table 3). This was mainly due to less interference of weeds with crop for natural resources during early crop growth period. This was in line with the findings of Walia *et al.* (2008), Yadav *et al.* (2009). Untreated weedy check plots recorded lower grain yield as compared to treated plots (Table 4).

Based on the above study it can be concluded that application of bispyribac sodium 10% SC a broad spectrum herbicide at 25 g a.i. per ha (15 DAT) as early post emergence herbicide effectively controlled major weeds in transplanted rice without comprising with respect to grain and straw yield.

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