E-ISSN: 2618-0618
P-ISSN: 2618-060X

NAAS Rating (2025): 5.20
www.agronomyjournals.com
2025; 8(9): 920-924
Received: 06-07-2025
Accepted: 08-08-2025

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Evaluation of the efficacy of bispyribac-sodium on transplanted rice (*Oryza sativa* L.) in northern hill region of Chhattisgarh

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DOI: https://www.doi.org/10.33545/2618060X.2025.v8.i9m.3877

Abstract
A field experiment was conducted at the Instructional-cum-Research Farm, Raj Mohini Devi College of Agriculture and Research Station, Ambikapur, Chhattisgarh during the *kharif* season of 2024 to assess the "Evaluation of the efficacy of Bispyribac-sodium on transplanted rice (*Oryza sativa* L.) in the northern hill region of Chhattisgarh." The trial consisted of six treatments, namely: T_1- Unweeded check, T_2- Two hand weeding at 20 and 40 DAT, T_3-Bispyribac-sodium 10% SC @ 20 g a.i. ha^{-1} at 20 DAT, T_4- Bispyribac-sodium 10% SC @ 40 g a.i. ha^{-1} at 20 DAT, T_5- Bispyribac-sodium 10% SC @ 60 g a.i. ha^{-1} at 20 DAT and T_6-Bispyribac-sodium 10% SC @ 80 g a.i. ha^{-1} at 20 DAT, arranged in a Randomized Complete Block Design (RcBD) with four replications. In the experimental field, lowest weed density and dry weight along with the highest weed control efficiency were observed under Two hand weeding at 20 and 40 DAT (T_2), which was statistically comparable to Bispyribac-sodium @ 80 g a.i. ha^{-1} (T_6) and Bispyribac-sodium @ 60 g a.i. ha^{-1} (T_5). Weed infestation in the Unweeded check (T_1) reduced the grain yield of rice by 41.51%. These results further indicated that the growth and yield attributes of transplanted rice such as plant height, number tillers hill^{-1}, number leaves hill^{-1}, plant dry matter accumulation, number of panicles hill^{-1}, number of grains panicle^{-1}, test weight, grain yield, straw yield and harvest index were maximum in Two hand weeding at 20 and 40 DAT (T_2). This treatment was statistically at par with Bispyribac-sodium @ 60 g a.i. ha^{-1} (T_5) and Bispyribac-sodium @ 40 g a.i. ha^{-1} (T_4), which also resulted in significantly higher rice yields without any phytotoxicity, except at the Bispyribac-sodium 80 g a.i. ha^{-1} dose, where adverse effects were noticed.

Keywords: Transplanted rice, efficacy, bispyribac-sodium, weed, growth and yield

Introduction
Rice (*Oryza sativa* L.) serves as the primary staple food for more than half of the global population. In Asia, over 2,000 million people derive nearly 60–70% of their daily calories from rice and its by-products. In India, about 65% of the total population depends on rice as a staple food. The country possesses the largest rice growing area in the world, covering 47.6 million hectares and stands second in production with 135.75 million tonnes to achieving the productivity level of 30.52 q ha^{-1}. In Chhattisgarh, rice occupies about 3.6 million hectares area, producing 7.9 million tonnes annually, with an average productivity of 21.01 q ha^{-1} (Anonymous, 2023) [2].

The rice-growing area in India has remained steady at around 47.6 million hectares. To achieve the projected production target of 147.35 million tonnes by 2025 AD, the productivity must increase from the current level of 2.05 t ha^{-1} to 3.2 t ha^{-1} (Subbaiah, 2006) [22]. Among the various production constraints, weed infestation has been identified as a major limiting factor, with yield losses due to crop-weed competition estimated at 28–45% (Singh *et al.*, 2003) [19]. Both rice and weeds draw nutrients, water and other resources from the same pool, but among weed categories, grassy weeds exert the highest competitive pressure, followed by sedges and then broad-leaved weeds (Raju and Reddy, 1986) [12]. Rice production is currently challenged by several constraints, such as a decline in yield growth rate, depletion of natural resources, scarcity of labour, gender-related issues, institutional shortcomings and environmental pollution.

In transplanted rice, weed infestation not only reduces yield but also adversely affects the quality of the produce.

Although manual weeding is effective but it is laborious, time-intensive and costly when practiced on a large scale. During the rainy season, continuous rainfall and shortage of labour further limit its feasibility. Under such circumstances, chemical weed management becomes a more practical option, as herbicides can suppress weed growth from the early stages of crop development. Commonly used pre-emergence herbicides in transplanted rice include butachlor, pretilachlor, pyrazosulfuron-ethyl, bensulfuron-methyl and the combination of bensulfuron-methyl + pretilachlor. However, the window of their application is very narrow (1-5 DAT). Farmers, therefore, often recognize the need for post-emergence herbicides to control weeds that appear at later crop stages. This highlights the importance of research aimed at identifying effective post-emergence herbicides capable of managing a wide range of annual and perennial grasses, sedges and broad-leaved weeds in rice ecosystems.

Materials and Methods

A field experiment was carried out during *kharif* 2024 at the Instructional-cum-Research Farm, Raj Mohini Devi College of Agriculture and Research Station, Ambikapur (Chhattisgarh). Geographically, Ambikapur lies at 20°08′ N latitude, 83°15′ E longitude and an altitude of 592.62 m above mean sea level. The area falls under the northern hill region (Agro-climatic Zone VII) of Chhattisgarh. The state of Chhattisgarh is divided into three agro-climatic zones and Ambikapur coming into the northern hill zone, characterized by undulating topography and red to lateritic soil. The experimental soil was sandy loam (Inceptisol), locally called 'Chawar'. It was slightly acidic in reaction with medium fertility, having low in N and K_2O and medium in P_2O_5. The experiment site Ambikapur (Chhattisgarh) has a sub-humid climate with rainfall of 1200-1400 mm. mostly during south-west monsoon. The experiment was laid-out with six treatments arranged in a Randomized Complete Block Design (RcBD) with four replications. Twenty-five days old seedlings of rice variety Vikram-TCR were transplanted on 28/08/2024 at a spacing of 20 cm × 10 cm and the crop was harvested on 06/12/2024. The crop was managed as per the university recommendations, applying 10 t ha^{-1} FYM and 120:60:40 kg NPK ha^{-1}. Weed density and weed dry weight were recorded at 90 DAT, while growth and yield attributes were observed at maturity. The data on weed density and weed dry weight were subjected to square root transformation ($\sqrt{x}$ + 0.5) before analysis.

Treatment details

Treatment no.	Treatment detail
T_1	Unweeded check
T_2	Two hand weeding at 20 & 40 DAT
T_3	Bispyribac-sodium 10% SC @ 20 g a.i ha^{-1} at 20 DAT
T_4	Bispyribac-sodium 10% SC @ 40 g a.i ha^{-1} at 20 DAT
T_5	Bispyribac-sodium 10% SC @ 60 g a.i ha^{-1} at 20 DAT
T_6	Bispyribac-sodium 10% SC @ 80 g a.i ha^{-1} at 20 DAT

*DAT- Days after transplanting

Results and Discussion

Studies on weeds

Weed density (m^{-2})

The predominant weed species found in the experimental field along with transplanted rice were *Echinochloa colona* (grasses); *Monochoria vaginalis* and *Ludwigia parviflora* (broad-leaved weeds); *Cyperus iria* (sedges). Other weeds such as *Fimbristylis miliacea*, *Leptochloa chinensis*, *Ischaemum rugosum* and *Commelina benghalensis* etc. were also present in the experimental field in negligible amounts.

Weed management practices exerted a significant impact on the total weed density at all observation stages 30, 60 and 90 DAT, respectively (Table 1). The highest weed density was recorded in the Unweeded check (T_1), with values of (120.46, 145.67 and 158.32 m^{-2}) respectively. On the other hand, the lowest weed density was observed in Two hand weeding at 20 and 40 DAT (T_2), which registered 7.25, 9.92 and 13.37 m^{-2} at the corresponding intervals. This was followed closely by Bispyribac-sodium 10% SC @ 80 g a.i. ha^{-1} at 20 DAT (T_6) with 13.75, 15.66 and 20.34 m^{-2} and Bispyribac-sodium 10% SC @ 60 g a.i. ha^{-1} at 20 DAT (T_5) with 16.23, 17.13 and 20.95 m^{-2}, respectively. These findings clearly indicate that manual weeding and the application of higher doses of Bispyribac-sodium were highly effective in suppressing weed infestation during different growth stages of transplanted rice. Similar observations were also reported by Rao *et al*. (2016) [14].

Weed dry weight (g m^{-2})

The treatment of Two hand weeding at 20 and 40 DAT (T_2) consistently registered the lowest weed dry weight of 10.26, 13.53 and 17.25 g m^{-2} at 30, 60 and 90 DAT, respectively (Table 1). This was statistically at par with Bispyribac-sodium 10% SC @ 80 g a.i. ha^{-1} at 20 DAT (T_6), which recorded 15.94, 22.45 and 27.37 g m^{-2} and Bispyribac-sodium 10% SC @ 60 g a.i. ha^{-1} at 20 DAT (T_5), which registered 17.26, 23.97 and 29.15 g m^{-2} at the corresponding intervals. In contrast, the Unweeded check (T_1) produced the highest weed dry weight across all stages, with values of 124.31, 150.56 and 189.57 g m^{-2}, respectively. Overall, the results revealed that manual weeding as well as the application of higher doses of Bispyribac-sodium were highly effective in reducing weed biomass throughout the crop growth period. These findings are agreement with the results of Lap *et al*. (2013) [8] and Singh *et al.* (2018) [6].

Weed control efficiency (%)

The weed control efficiency (WCE) was highest in Two hand weeding at 20 and 40 DAT (T_2) across all observation stages, recording 87.29%, 92.18% and 94.46% at 30, 60 and 90 DAT, respectively (Table 1). Among the herbicidal treatments, the maximum WCE was achieved with Bispyribac-sodium 10% SC @ 80 g a.i. ha^{-1} at 20 DAT (T_6), which recorded 83.27%, 85.88% and 85.81% at the corresponding intervals. This was followed closely by Bispyribac-sodium 10% SC @ 60 g a.i. ha^{-1} at 20 DAT (T_5), which registered 81.85%, 84.21% and 84.91%, respectively. In contrast, the lower dose of Bispyribac-sodium 10% SC @ 20 g a.i. ha^{-1} at 20 DAT (T_3) resulted in comparatively lower WCE values of 65.13%, 66.92% and 65.29% throughout the growth period. As expected, the Unweeded check (T_1) consistently showed 0% WCE. These observations are in line with the earlier findings of Rawat *et al.* (2012) [16] and Uma *et al.* (2014) [24].

Studies on crops

Plant height (cm)

Plant height showed a progressive increase with the advancement of crop growth across all treatments (Table 2). The maximum plant height was obtained in Two hand weeding at 20 and 40 DAT (T_2), which produced significantly taller plants at all growth stages (102.31 cm) at harvest stage. Similar results

were also reported by Mishra and Singh (2011) and Rao *et al.* (2015) [13]. Among the herbicidal treatments, the height plant height was observed with Bispyribac-sodium 10% SC @ 60 g a.i. ha^{-1} at 20 DAT (T_5), which measured 99.61 cm at the corresponding interval. This treatment was statistically at par with Bispyribac-sodium 10% SC @ 40 g a.i. ha^{-1} (T_4) and Bispyribac-sodium 10% SC @ 80 g a.i. ha^{-1} (T_6). These findings are agreement with the observations of Chinnusamy *et al.* (2015) [3] and Sharma *et al.* (2017) [18]. In contrast, the Unweeded check (T_1) consistently produced the lowest plant height from 60 DAT onwards with 90.12 cm at harvest, due to continuous competition from weeds.

Number of tillers hill^{-1}

The highest number of tillers was consistently observed in Two hand weeding at 20 and 40 DAT (T_2), which produced 12.72 tillers hill^{-1} at harvest stage (Table 2). Among the herbicidal treatments, Bispyribac-sodium 10% SC @ 60 g a.i. ha^{-1} at 20 DAT (T_5) proved most effective, recording with 12.02 tillers hill^{-1} at the corresponding stage. This was statistically at par with Bispyribac-sodium 10% SC @ 40 g a.i. ha^{-1} at 20 DAT (T_4) and Bispyribac-sodium 10% SC @ 80 g a.i. ha^{-1} at 20 DAT (T_6). On the other hand, the lowest number of tillers was recorded in the Unweeded check (T_1), which registered only 7.81 tillers hill^{-1} at the respective intervals. These findings are consistent with the reports of Rawat *et al.* (2012) [16] and Prakash *et al*. (2014) [10].

Number of leaves hill^{-1}

At all stages of crop growth, the maximum number of leaves hill^{-1} was recorded with Two hand weeding at 20 and 40 DAT (T_2), which produced 44.31 leaves hill^{-1} at 90 DAT, (Table 2). Similar results were reported by Singh *et al.* (2012) [20] and Prakash *et al.* (2017) [11]. Among the herbicidal treatments, Bispyribac-sodium 10% SC @ 60 g a.i. ha^{-1} at 20 DAT (T_5) registered the second highest number of leaves hill^{-1} (42.81) at the respective stage, which was statistically at par with Bispyribac-sodium 10% SC @ 40 g a.i. ha^{-1} at 20 DAT (T_4) (40.51 leaves hill^{-1} at 90 DAT) and Bispyribac-sodium 10% SC @ 80 g a.i. ha^{-1} at 20 DAT (T_6) (40.00 leaves hill^{-1} at 90 DAT). This reflects the effectiveness of higher doses of Bispyribac-sodium in suppressing weeds and promoting crop growth. These findings are in close agreement with those of Yadav *et al.* (2018) [26] and Choudhary *et al.* (2014) [4]. Conversely, the lowest number of leaves hill^{-1} was consistently observed in the Unweeded check (T_1), with values of 34.12 leaves hill^{-1} at the respective interval, indicating severe crop-weed competition. Similar observations were earlier reported by Reddy and Reddi (2016) [17].

Plant dry matter accumulation (g hill^{-1})

The maximum dry matter accumulation was recorded under Two hand weeding at 20 and 40 DAT (T_2), with values of 36.74 g hill^{-1} at harvest stage (Table 2). These results are consistent with the findings of Kumar *et al.* (2020) [5]. Among the herbicidal treatments, Bispyribac-sodium 10% SC @ 60 g a.i. ha^{-1} at 20 DAT (T_5) performed next best, producing 35.04 g hill^{-1} at the respective growth stage. This treatment was statistically comparable with hand weeding and significantly superior to the lower doses of Bispyribac-sodium 10% SC @ 40 g a.i. ha^{-1} (T_4) and 20 g a.i. ha^{-1} (T_3) at 20 DAT. Similar observations were also reported by Rao *et al.* (2017) [15]. In contrast, the Unweeded check (T_1) consistently recorded the lowest dry matter accumulation, with values of 23.21 g hill^{-1} at respective interval as documented by Choudhary *et al.* (2020) [5].

Phyto-toxicity symptoms

Phytotoxicity symptoms were observed at 10, 20 and 30 days after herbicide application (DAHA). The lower doses of Bispyribac-sodium 10% SC @ 20-40 g a.i. ha^{-1} at 20 DAT caused only mild yellowing at 10 and 20 DAHA, with complete recovery by 30 DAHA, indicating that these doses are quite safe for rice. Increasing the dose to Bispyribac-sodium 10% SC @ 60 g a.i. ha^{-1} at 20 DAT (T_5) produced moderate initial toxicity at 10 and 20 DAHA, with recovery by 30 DAHA. In contrast, the highest dose, Bispyribac-sodium 10% SC 80 g a.i. ha^{-1} at 20 DAT (T_6), caused leaf yellowing and stunted growth of the crop (Table 3). These observations are agreement with the findings of Choudhary *et al.* (2018) [6] and Tiwari *et al.* (2019) [23]. The phyto-toxicity rating was performed following as per the European Weed Research Society (EWRS) classification scale (Anonymous, 1981) [1].

Number of panicle hill^{-1}

The maximum number of panicles per hill (14.6) was recorded under Two hand weeding at 20 and 40 DAT (T_2), which was significantly superior to all herbicidal treatments (Table 4). Among the herbicidal treatments, Bispyribac-sodium 10% SC @ 60 g a.i. ha^{-1} at 20 DAT (T_5) produced the highest panicle count of 12.21 hill^{-1}, which was statistically at par with Bispyribac-sodium 10% SC @ 40 g a.i. ha^{-1} at 20 DAT (T_4) (11.50 hill^{-1}) and Bispyribac-sodium 10% SC @ 80 g a.i. ha^{-1} at 20 DAT (T_6) (11.31 hill^{-1}). The lowest number of panicles (8.31 hill^{-1}) was observed in the Unweeded check (T_1), likely due to severe weed competition suppressing tiller development and panicle initiation. These results are consistent with the findings of Prakash *et al*. (2014) [10] and Yadav *et al*. (2021) [25].

Number of grain panicle^{-1}

The highest number of grains per panicle (128.3) was obtained under Two hand weeding at 20 and 40 DAT (T_2), which was significantly superior to all herbicidal treatments (Table 4). Among the herbicidal treatments, Bispyribac-sodium 10% SC @ 60 g a.i. ha^{-1} at 20 DAT (T_5) produced the greatest grain number (122.30), followed closely by Bispyribac-sodium 10% SC @ 80 g a.i. ha^{-1} at 20 DAT (T_6) (120.11) and Bispyribac-sodium 10% SC @ 40 g a.i. ha^{-1} at 20 DAT (T_4) (118.51). These treatments were statistically at par and significantly higher than the Unweeded check (T_1), which recorded the lowest number of grains per panicle (99.41). These observations are consistent with the findings of Yadav *et al*. (2021) [25].

Test weight (g)

The highest test weight (25.7 g) was recorded under Two hand weeding at 20 and 40 DAT (T_2), which was statistically at par with Bispyribac-sodium 10% SC @ 60 g a.i. ha^{-1} at 20 DAT (T_5), Bispyribac-sodium 10% SC @ 80 g a.i. ha^{-1} at 20 DAT (T_6) and Bispyribac-sodium 10% SC @ 40 g a.i. ha^{-1} at 20 DAT (T_4). In contrast, the lowest test weight (22.81 g) was observed in the Unweeded check (T_1). These findings are agreement with the reports of Prakash *et al*. (2014) [10] and Yadav *et al*. (2021) [25] (Table 4).

Grain yield (Kg ha^{-1})

The highest grain yield (5378 kg ha^{-1}) was recorded under Two hand weeding at 20 and 40 DAT (T_2), which was significantly superior to all herbicidal treatments (Table 4). Among the herbicidal treatments, the maximum grain yield (5104 kg ha^{-1}) was observed with Bispyribac-sodium 10% SC @ 60 g a.i. ha^{-1} at 20 DAT (T_5), followed by Bispyribac-sodium 10% SC @ 40 g

a.i. ha^{-1} at 20 DAT (T_4) (4672 kg ha^{-1}) and Bispyribac-sodium 10% SC @ 80 g a.i. ha^{-1} at 20 DAT (T_6) (4598 kg ha^{-1}). All these treatments performed significantly better than the lower dose, Bispyribac-sodium 10% SC @ 20 g a.i. ha^{-1} at 20 DAT (T_3) (4153 kg ha^{-1}). The lowest grain yield was recorded in the Unweeded check (T_1), likely due to intense weed competition, which restricted nutrient uptake, reduced photosynthetic efficiency and adversely affected overall plant health. These observations are in line with the findings of Prakash *et al*. (2014) [10] and Yadav *et al*. (2021) [25].

Straw yield (Kg ha^{-1})

The maximum straw yield (6971 kg ha^{-1}) was recorded under Two hand weeding at 20 and 40 DAT (T_2), which was statistically at par with Bispyribac-sodium 10% SC @ 60 g a.i. ha^{-1} at 20 DAT (T_5) (Table 4). Among the herbicidal treatments, T_5 produced the highest straw yield (6826 kg ha^{-1}), followed by Bispyribac-sodium 10% SC @ 80 g a.i. ha^{-1} at 20 DAT (T_6) (6531 kg ha^{-1}) and Bispyribac-sodium 10% SC @ 40 g a.i. ha^{-1} at 20 DAT (T_4) (6489 kg ha^{-1}). These treatments performed considerably better than the lower dose Bispyribac-sodium 10% SC @ 20 g a.i. ha^{-1} at 20 DAT (T_3) (6152 kg ha^{-1}) and were significantly superior to the Unweeded check (T_1). A similar trend has been reported by Prakash *et al*. (2014) [10] and Yadav *et al*. (2021) [25].

Harvest index (%)

The highest harvest index (43.52%) was recorded under Two hand weeding at 20 and 40 DAT (T_2), which was statistically at par with Bispyribac-sodium 10% SC @ 60 g a.i. ha^{-1} (T_5), 80 g a.i. ha^{-1} (T_6) and 40 g a.i. ha^{-1} (T_4) treatments (Table 4). Among the herbicidal treatments, T_5 recorded the highest harvest index (42.81%), followed by T_4 (41.90%) and T_6 (41.31%). The lowest harvest index was observed in the Unweeded check (T_1) (36.51%). These results are agreement with the findings of Prakash *et al*. (2014) [10] and Yadav *et al*. (2021) [25].

Weed index (%)

In the present study, the lowest weed index (0.0%) was recorded under Two hand weeding at 20 and 40 DAT (T_2), indicating its complete effectiveness in controlling weed competition and achieving maximum yield potential (Table 4). Among the herbicidal treatments, Bispyribac-sodium 10% SC @ 60 g a.i. ha^{-1} at 20 DAT (T_5) exhibited the lowest weed index (5.1%), followed by Bispyribac-sodium 10% SC @ 40 g a.i. ha^{-1} at 20 DAT (T_4) (13.12%), 80 g a.i. ha^{-1} (T_6) (14.51%) and 20 g a.i. ha^{-1} (T_3) (22.81%). These results are consistent with the observations of Rawat *et al.* (2012) [16].

Table 1: Effect of treatments on weed growth in transplanted rice

Treatment	Total weed density (m^{-2})			Total weed dry weight (g m^{-2})			Weed control efficiency (%)		
	30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT
T_1	11.7 (120.46)	12.09 (145.67)	12.59 (158.32)	11.17 (124.31)	12.32 (150.56)	13.76 (189.57)	0.00	0.00	0.00
T_2	2.74 (7.25)	3.39 (9.92)	3.75 (13.37)	3.28 (10.26)	3.71 (13.53)	4.18 (17.25)	87.29	92.18	94.46
T_3	5.71 (31.94)	6.32 (38.63)	6.73 (44.26)	5.85 (33.15)	7.21 (50.86)	8.15 (66.15)	65.13	66.92	65.29
T_4	4.74 (21.73)	5.15 (21.25)	5.75 (32.84)	5.10 (25.02)	6.05 (35.65)	7.23 (45.95)	73.62	76.34	75.88
T_5	4.14 (16.23)	4.26 (17.13)	4.80 (22.95)	4.20 (17.26)	4.95 (23.97)	5.46 (29.15)	81.85	84.21	84.91
T_6	3.85 (13.75)	4.06 (15.66)	4.65 (20.34)	4.03 (15.94)	4.82 (22.45)	5.29 (27.37)	83.27	85.16	85.88
SEm (±)	0.29	0.27	0.24	0.21	0.23	0.25	NA	NA	NA
CD (P=0.05)	0.88	0.81	0.72	0.64	0.69	0.75	NA	NA	NA

*Figures in the parentheses are original values; data were transformed through √x+0.5

Table 2: Effect of treatments on growth attributes in transplanted rice

Treatment	Plant height (cm) (At harvest)	No. of tillers hill^{-1} (At harvest)	No. of leaves hill^{-1} (At 90 DAT)	Plant dry matter accumulation (g m^{-2}) (At harvest)
T_1	90.12	7.81	34.12	23.21
T_2	102.31	12.72	44.31	36.74
T_3	94.12	10.00	38.21	29.81
T_4	97.90	11.11	40.51	32.61
T_5	99.61	12.02	42.81	35.04
T_6	98.12	11.31	40.00	32.04
SEm (±)	0.83	0.30	0.77	0.53
CD (P=0.05)	2.51	0.91	2.32	1.56

Table 3: Effect of treatments on phyto-toxicity in transplanted rice

Treatment	Phyto-toxicity symptoms		
	10 DAHA	20 DAHA	30 DAHA
T_1 -Unweeded check	0.0	0.0	0.0
T_2 -Two hand weeding at 20 & 40 DAT	0.0	0.0	0.0
T_3 -Bispyribac-sodium 10% SC @ 20 g a.i ha^{-1} at 20 DAT	0.5	0.0	0.0
T_4 -Bispyribac-sodium 10% SC @ 40 g a.i ha^{-1} at 20 DAT	1.0	0.5	0.0
T_5 -Bispyribac-sodium 10% SC @ 60 g a.i ha^{-1} at 20 DAT	2.0	1.0	0.0
T_6 -Bispyribac-sodium 10% SC @ 80 g a.i ha^{-1} at 20 DAT	3.0	2.0	1.0

*DAHA- Days after herbicide application

Table 4: Effect of treatments on yield in transplanted rice

Treatment	No. of panicle hill^{-1}	No. of grain panicle^{-1}	Test weight (g)	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})	Harvest index (%)	Weed index (%)
T_1	8.31	99.41	22.81	3145	5472	36.51	41.51
T_2	14.60	128.31	25.70	5378	6971	43.52	0.00
T_3	10.21	112.70	24.20	4153	6152	40.31	22.81
T_4	11.50	118.51	24.90	4672	6489	41.90	13.12
T_5	12.21	122.30	25.11	5104	6826	42.81	5.12
T_6	11.31	120.11	24.70	4598	6531	41.31	14.51
SEm (±)	0.41	1.91	0.51	71	84	0.91	NA
CD (P=0.05)	1.23	5.78	1.48	212	251	2.69	NA

Conclusion

Two hand weeding at 20 and 40 DAT (T_2) ensured the most effective weed control, superior crop growth and yield whereas in herbicidal treatment, Bispyribac-sodium 10% SC @ 60 g a.i. ha^{-1} at 20 DAT (T_5) was optimal, providing high weed control efficiency, crop growth and yield. Overall, T_2 and T_5 proved the most effective viable options for transplanted rice as well as direct-seeded rice crop specially for weed infested areas.

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