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Performance Evaluation of Different Doses of Triafamone 200 SC on Weed Dynamics of Transplanted Kharif Rice in Agroclimatic Zone of Andhra Pradesh, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: Weed management plays a pivotal role in Rice cultivation, particularly in transplanted Rice systems, where unchecked weed growth can lead to significant yield losses and reduced crop quality. Transplant Rice fields tend to face rampant weed transplant Rice fields tend to face rampant weed infestations because weeds experience highly conducive growth conditions, which results in a

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fierce competition for limited resources like nutrients, water, and sunlight. To counter this problem, chemical herbicides have proved to be one of the most effective measures for weed control against various weed species and maximizing crop productivity. Of the variety of herbicides on the market, Triafamone 200 SC is a potential candidate because it specifically targets a broad array of weeds and is also selective to Rice. The efficacy of Triafamone 200 SC compared to other herbicides is still an area of research. It is important to understand the comparative efficacy of various herbicides to formulate effective weed management plans specific to the agronomic situation.

Methodology: A two-year field study was carried out during the 2017-18, *Rabi* season and the 2018-19, *Kharif* season at the Agricultural Research Station located at Jangamaheswarapuram, Guntur District, Andhra Pradesh, India. The experimental design comprised 13 treatments arranged in a completely randomized block structure with four replications. Weed control efficiency (WCE) indicates percent reduction in weed dry matter due to weed control treatments over unweeded control. The data on weeds were transformed by square root transformation by adding one before being subjected to ANOVA.

Results: Findings from the study revealed that among the various treatments, Triafamone 200 SC @ 100 g a.i. ha^{-1} applied at 2-3 days after transplanting (DAT) (T_{10}) achieved the highest weed control efficiency, recording 68.64% during *Rabi,* 2017-18 and 60.83% in *Kharif,* 2018-19. This result was statistically comparable to the treatment T_5 (Triafamone 200 SC @ 100 g a.i. ha^{-1} applied at the 2-3 leaf stage of weeds), which achieved 63.60% and 59.02% efficiency in the respective seasons, while outperforming all other treatments in both years of the study.

Conclusion: The applied weed management practices demonstrated significant effectiveness in controlling grasses, broad-leaved weeds and sedges, thereby reducing competition for essential growth resources.

Keywords: Weed management; transplanted rice; weed density; weed dry weight; weed control efficiency.

1. INTRODUCTION

Weeds rank as the most formidable and pervasive biological menace to crop production in India, causing enormous losses in agricultural productivity. According to a recent joint study by the Federation of Seed Industry of India (FSII) and the ICAR-Directorate of Weed Research, weeds are responsible for annual crop losses amounting to approximately ₹92,000 crore, accounting for 25–26% yield loss in kharif crops and 18–25% in rabi crops (FSII & ICAR-DWR, 2024).

In such situations, herbicidal weed control is preferred for its higher effectiveness, lower cost, and shorter time commitment. Choosing the right herbicides for the infesting weed is essential for effective weed control (Basu et al., 2023; Dhaarani et al., 2025). Herbicidal weed control plays a vital role in sustainable crop management, but residual effects on succeeding crops require careful evaluation. While herbicides can effectively manage weeds when applied at recommended rates, their persistence in the soil poses challenges for subsequent crops. Some herbicides degrade slowly, remaining active for weeks, months, or even years, potentially inhibiting plant growth (Arthanari, 2024; Jyothi Basu et al., 2025). Weeds are among the most severe and widespread biological obstacles to crop production in India, contributing to significant losses in agricultural yields. Recent findings indicate that yield losses can reach up to 57% in transplanted rice and as high as 82% in direct-seeded rice systems, particularly under inadequate weed control (Balaji et al., 2024). In rice cultivation, weed-induced yield reductions vary depending on the farming method, typically ranging from 18-20% in transplanted rice, 30-35% in direct-sown puddled rice, and exceeding 50% in direct-seeded upland rice. Globally, weed infestations in dry direct-seeded rice (DDSR) systems have been associated with yield reductions of up to 50%, translating into an estimated $4.2 billion in annual losses (Shekhawat et al., 2020).

Weed management plays a pivotal role in rice cultivation, particularly in transplanted systems, where unchecked weed growth can lead to significant yield losses and reduced crop quality. Transplanted rice fields often experience rampant weed infestations due to highly conducive growth conditions, resulting in intense competition for essential resources such as nutrients, water, and sunlight (Pervaiz et al., 2024).

Transplanted Rice fields often encounter heavy weed infestations due to favorable growth conditions for weeds, creating intense competition for essential resources such as nutrients, water, and sunlight (Jyothi Basu et al., 2021). To address this challenge, chemical herbicides have emerged as one of the most effective solutions for controlling diverse weed species and ensuring optimal crop productivity. Pre-emergence herbicides play a pivotal role in preventing weed establishment and competition with the transplanted rice. On the other hand, post-emergence herbicides are applied after both the crop and weed seedlings have emerged and these herbicides provide targeted control of established weeds that might have escaped pre-emergence treatments. However, a balanced and integrated approach to weed management is essential to ensure the long-term sustainability of agricultural practices while minimizing potential negative impacts on the environment and weed resistance development (Ghosh et al., 2025). Among the range of herbicides available, Triafamone 200 SC stands out as a promising option due to its targeted action against a wide spectrum of weeds and its compatibility with Rice crops. However, the effectiveness of Triafamone 200 SC in comparison to other herbicides remains a critical area of investigation. Understanding the comparative performance of different herbicides is essential for devising effective weed control strategies tailored to specific agronomic conditions (Jyothi basu et al., 2023a).

This study focuses on evaluating the bioefficacy of Triafamone 200 SC and other herbicides in managing weed dynamics in transplanted Rice fields. By analysing key parameters such as weed control efficiency and crop-weed competition, this research aims to provide valuable insights into the strengths and limitations of various herbicides. Such findings are expected to contribute to improved decision-making for farmers and agricultural stakeholders, enabling the adoption of sustainable and economically viable weed management practices. Furthermore, the outcomes of this research will serve as a resource for guiding future studies on herbicide performance (Basu et al., 2023b).

2. MATERIALS AND METHODS

A field study was carried out over two consecutive years (2017-18 and 2018-19) at the Agricultural Research Station in Jangamaheswarapuram, Guntur District, Andhra Pradesh, India. The experiment was conducted on clay loam soils and comprised thirteen treatments with four replications, which are detailed Table 1.

Triafamone is categorized under keto sulfonanilide herbicides and is absorbed by plants through leaves and roots. Once absorbed, it undergoes rapid conversion to an intermediate form via reduction of the keto group. Unlike Rice, weeds produce a secondary metabolite through N-demethylation, which effectively inhibits acetolactate synthase (ALS) (Basu et al., 2023a).

Table 1. Treatment, doses and corresponding time of application for weed management

Treatment	Dose (g a.i. ha^{-1})	Time of Application
$T_{1.}$ Untreated control	-	-
$T_{2.}$ Triafamone 200 SC at 2-3 leaf stage of weed	30	2 to 3 leaf stage of weed
$T_{3.}$ Triafamone 200 SC at 2-3 leaf stage of weed	40	2 to 3 leaf stage of weed
$T_{4.}$ Triafamone 200 SC at 2-3 leaf stage of weed	50	2 to 3 leaf stage of weed
$T_{5.}$ Triafamone 200 SC at 2-3 leaf stage of weed	100	2 to 3 leaf stage of weed
$T_{6.}$ Pyrazosulfuron ethyl 10% WP	15	2 to 3 leaf stage of weed
$T_{7.}$ Triafamone 200 SC at 0-3 DAT	30	0 to 3 days after transplanting
$T_{8.}$ Triafamone 200 SC at 0-3 DAT	40	0 to 3 days after transplanting
$T_{9.}$ Triafamone 200 SC at 0-3 DAT	50	0 to 3 days after transplanting
$T_{10.}$ Triafamone 200 SC at 0-3 DAT	100	0 to 3 days after transplanting
$T_{11.}$ Pretilachlor 50% EC at 0-3 DAT	750	0 to 3 days after transplanting
$T_{12.}$ Farmer practice (two hand weedings)	-	20 DAT and 40 DAT
$T_{13.}$ Weed free	-	-

Table 2. Density of weeds (No. m^{-2}) at different growth stages of transplanted Rice as influenced by weed management practices during *Rabi,* 2017-18 and *Kharif,* 2018-19

Treatments	Dose (g a.i. ha^{-1})	*Echinochloa colonum* 28 DAA		*Echinochloa colonum* 42 DAA		*Leptochloa chinensis* 28 DAA		*Leptochloa chinensis* 42 DAA	
		2017-18	**2018-19**	**2017-18**	**2018-19**	**2017-18**	**2018-19**	**2017-18**	**2018-19**
T_1: Untreated control	-	6.95 (48.3)	5.29 (27.8)	7.77 (60.3)	6.29 (39.5)	2.08 (4.0)	2.32 (5.0)	2.96 (8.5)	3.27 (10.3)
T_2: Triafamone 200 SC at 2-3 leaf stage of weed	30	3.98 (15.8)	3.18 (9.8)	4.94 (24.8)	4.20 (17.3)	2.03 (4.0)	2.39 (5.3)	2.63 (6.8)	3.16 (9.5)
T_3: Triafamone 200 SC at 2-3 leaf stage of weed	40	3.64 (13.0)	3.11 (9.3)	4.02 (15.8)	3.79 (14.0)	1.92 (3.3)	2.27 (4.8)	2.33 (5.0)	3.10 (9.3)
T_4: Triafamone 200 SC at 2-3 leaf stage of weed	50	3.04 (9.0)	2.77 (7.5)	3.68 (13.3)	3.58 (12.5)	2.19 (4.5)	2.09 (4.0)	2.62 (6.5)	2.97 (8.5)
T_5: Triafamone 200 SC at 2-3 leaf stage of weed	100	2.19 (4.5)	2.68 (6.8)	3.05 (9.0)	3.45 (11.5)	2.17 (4.3)	2.05 (3.8)	2.54 (6.0)	2.34 (5.0)
T_6. Pyrazosulfuron ethyl 10% WP	15	4.03 (16.0)	3.89 (14.8)	5.25 (27.3)	4.95 (24.3)	1.76 (2.8)	2.48 (5.8)	2.47 (5.8)	2.90 (8.0)
T_7. Triafamone 200 SC) at 0-3 DAT	30	3.89 (15.0)	3.15 (9.5)	4.81 (22.8)	3.69 (13.3)	2.29 (5.0)	2.08 (4.0)	2.83 (7.8)	2.66 (6.8)
T_8. Triafamone 200 SC) at 0-3 DAT	40	3.53 (12.3)	2.92 (8.3)	4.12 (16.8)	3.61 (12.8)	2.19 (4.5)	2.11 (4.0)	2.79 (7.5)	2.64 (6.5)
T_9. Triafamone 200 SC) at 0-3 DAT	50	2.84 (7.8)	2.89 (8.0)	3.85 (14.5)	3.56 (12.3)	1.89 (3.3)	2.03 (3.8)	2.40 (5.5)	2.47 (5.8)
T_{10}. Triafamone 200 SC) at 0-3 DAT	100	1.87 (3.3)	2.71 (7.0)	2.27 (4.8)	3.55 (12.3)	2.36 (5.3)	1.87 (3.3)	2.62 (6.5)	2.41 (5.5)
T_{11}. Pretilachlor 50% EC at 0-3 DAT	750	4.27 (18.0)	3.51 (12.0)	5.02 (25.0)	4.58 (20.8)	1.68 (2.5)	1.98 (3.5)	2.08 (4.0)	2.60 (6.5)
T_{12}. Farmer practice (two hand weedings)	-	1.70 (2.5)	1.98 (3.5)	1.70 (2.5)	2.12 (4.3)	1.31 (1.3)	1.06 (0.8)	1.48 (1.8)	1.18 (1.0)
T_{13}. Weed free	-	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71(0.0)	0.71 (0.0)	0.71 (0.0)	0.71(0.0)
SEm ±	-	0.30	0.20	0.27	0.23	0.19	0.18	0.21	0.19
CD (P = 0.05)	-	0.86	0.57	0.77	0.66	0.55	0.50	0.60	0.54

Note: Data transformed to $\sqrt{x+0.5}$ transformations. Figures in parenthesis are original values

Table 2. Density of weeds (No. m^{-2}) at different growth stages of transplanted Rice as influenced by weed management practices during *Rabi*, 2017-18 and *Kharif*, 2018-19 (CONTD)

Treatments	Dose (g a.i. ha^{-1})	*Dinebra retroflexa* 28 DAA		*Dinebra retroflexa* 42 DAA		*Cyperus rotundus* 28 DAA		*Cyperus rotundus* 42 DAA	
		2017-18	2018-19	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19
T_1. Untreated control	-	1.56 (2.0)	1.92 (3.3)	2.22 (4.5)	2.49 (6.0)	2.68 (6.8)	2.30 (5.0)	3.44 (11.5)	3.11 (9.3)
T_2. Triafamone 200 SC at 2-3 leaf stage of weed	30	1.18 (1.0)	1.70 (2.5)	1.56 (2.0)	2.16 (4.3)	1.92 (3.3)	2.10 (4.0)	2.44 (5.5)	2.60 (6.5)
T_3. Triafamone 200 SC at 2-3 leaf stage of weed	40	0.71 (0.0)	1.48 (1.8)	1.18 (1.0)	1.98 (3.5)	1.77 (2.8)	1.98 (3.5)	2.42 (5.5)	2.44 (5.5)
T_4. Triafamone 200 SC at 2-3 leaf stage of weed	50	0.71 (0.0)	1.13 (1.0)	1.27 (1.3)	1.46 (2.0)	1.54 (2.0)	2.00 (3.5)	2.05 (3.8)	2.33 (5.0)
T_5. Triafamone 200 SC at 2-3 leaf stage of weed	100	0.71 (0.0)	1.06 (0.8)	0.71 (0.0)	1.13 (1.0)	1.49 (1.8)	1.86 (3.0)	1.92 (3.3)	2.39 (5.3)
T_6. Pyrazosulfuron ethyl 10% WP	15	1.48 (1.8)	1.63 (2.3)	1.99 (3.5)	2.10 (4.0)	1.70 (2.5)	2.12 (4.3)	2.25 (4.8)	2.65 (6.8)
T_7. Triafamone 200 SC) at 0-3 DAT	30	1.70 (2.5)	1.40 (1.5)	2.15 (4.3)	1.64 (2.3)	1.70 (2.5)	2.17 (4.3)	2.22 (4.5)	2.72 (7.0)
T_8. Triafamone 200 SC) at 0-3 DAT	40	1.56 (2.0)	1.27(1.3)	1.79 (2.8)	1.48 (1.8)	1.73 (2.5)	1.92 (3.3)	2.17 (4.3)	2.44 (5.5)
T_9. Triafamone 200 SC) at 0-3 DAT	50	0.71 (0.0)	1.18 (1.0)	0.71 (0.0)	1.36 (1.5)	1.54 (2.0)	1.73 (2.5)	2.15 (4.3)	2.18 (4.3)
T_{10}. Triafamone 200 SC) at 0-3 DAT	100	0.71 (0.0)	0.84 (0.3)	0.71 (0.0)	1.10 (0.8)	1.48 (1.8)	1.64 (2.3)	1.84 (3.0)	2.00 (3.5)
T_{11}. Pretilachlor 50% EC at 0-3 DAT	750	1.40 (1.5)	1.92 (3.3)	1.79 (2.8)	2.43 (5.5)	2.32 (5.0)	2.27 (4.8)	3.00 (8.8)	2.68 (6.8)
T_{12}. Farmer practice (two hand weedings)	-	0.97 (0.5)	0.71 (0.0)	1.18 (1.0)	1.10 (0.8)	1.10 (0.8)	1.06 (0.8)	1.35 (1.5)	1.22 (1.3)
T_{13}. Weed free	-	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)
SEm $\pm$	-	0.11	0.17	0.14	0.21	0.17	0.17	0.19	0.17
CD (P = 0.05)	-	0.32	0.49	0.39	0.60	0.48	0.48	0.56	0.50

Note: Data transformed to $\sqrt{x+0.5}$ transformations. Figures in parenthesis are original values

Table 2. Density of weeds (No. m^{-2}) at different growth stages of transplanted Rice as influenced by weed management practices during *Rabi,* 2017-18 and *Kharif,* 2018-19 (CONTD)

Treatments	Dose (g a.i. ha^{-1})	*Cyperus difformis* 28 DAA		*Cyperus difformis* 42 DAA		*Eclipta alba* 28 DAA		*Eclipta alba* 42 DAA	
		2017-18	**2018-19**	**2017-18**	**2018-19**	**2017-18**	**2018-19**	**2017-18**	**2018-19**
T_1. Untreated control	-	1.76 (2.8)	1.84 (3.0)	2.29 (5.0)	2.44 (5.5)	2.46 (5.8)	2.53 (6.0)	3.28 (10.5)	3.45 (11.5)
T_2. Triafamone 200 SC at 2-3 leaf stage of weed	30	1.63 (2.3)	1.70 (2.5)	2.08 (4.0)	2.04 (3.8)	2.38 (5.3)	2.27 (4.8)	2.95 (8.3)	2.86 (7.8)
T_3. Triafamone 200 SC at 2-3 leaf stage of weed	40	1.70 (2.5)	1.70 (2.5)	2.17 (4.3)	2.09 (4.0)	2.22 (4.5)	2.22 (4.5)	2.82 (7.5)	2.57 (6.3)
T_4. Triafamone 200 SC at 2-3 leaf stage of weed	50	1.55 (2.0)	1.48 (1.8)	2.11 (4.0)	1.79 (2.8)	2.15 (4.3)	1.99 (3.8)	2.68 (6.8)	2.39 (5.5)
T_5. Triafamone 200 SC at 2-3 leaf stage of weed	100	1.31 (1.3)	1.40 (1.5)	1.86 (3.0)	1.79 (2.8)	1.76 (2.8)	1.92 (3.3)	2.38 (5.3)	2.38 (5.3)
T_6. Pyrazosulfuron ethyl 10% WP	15	1.18 (1.0)	1.70 (2.5)	1.70 (2.5)	2.10 (4.0)	1.82 (3.0)	2.24 (4.8)	2.47 (5.8)	2.74 (7.3)
T_7. Triafamone 200 SC) at 0-3 DAT	30	1.56 (2.0)	1.56 (2.0)	1.98 (3.5)	1.98 (3.5)	2.03 (3.8)	1.98 (3.5)	2.60 (6.5)	2.58 (6.3)
T_8. Triafamone 200 SC) at 0-3 DAT	40	1.63 (2.3)	1.48 (1.8)	1.96 (3.5)	1.84 (3.0)	1.82 (3.0)	1.86 (3.0)	2.45 (5.8)	2.15 (5.0)
T_9. Triafamone 200 SC) at 0-3 DAT	50	1.54 (2.0)	1.40 (1.5)	1.92 (3.3)	1.84 (2.5)	1.70 (2.5)	1.71 (2.5)	2.31 (5.0)	2.15 (4.3)
T_{10}. Triafamone 200 SC) at 0-3 DAT	100	1.06 (0.8)	1.31 (1.3)	1.35 (1.5)	1.65 (2.3)	0.71 (0.0)	1.64 (2.3)	1.18 (1.0)	1.99 (3.5)
T_{11}. Pretilachlor 50% EC at 0-3 DAT	750	1.70 (2.5)	1.98 (3.5)	2.22 (4.5)	2.39 (5.3)	2.27 (4.8)	2.39 (5.3)	2.79 (7.5)	2.99 (8.5)
T_{12}. Farmer practice (two hand weedings)	-	0.71 (0.0)	0.71 (0.0)	0.97 (0.5)	0.97 (0.5)	0.71 (0.0)	0.97 (0.5)	0.97 (0.5)	1.10 (0.8)
T_{13}. Weed free	-	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)
SEm $\pm$	-	0.16	0.13	0.16	0.15	0.19	0.18	0.21	0.18
CD (P = 0.05)	-	0.47	0.38	0.47	0.43	0.54	0.52	0.61	0.51

Note: Data transformed to $\sqrt{x+0.5}$ transformations. Figures in parenthesis are original values

Table 2. Density of weeds (No. m^{-2}) at different growth stages of transplanted Rice as influenced by weed management practices during *Rabi,* 2017-18 and *Kharif,* 2018-19 (CONTD)

Treatments	Dose (g a.i. ha^{-1})	*Ammannia baccifera*		*Ammannia baccifera*		*Trianthema portulacastrum*		*Trianthema portulacastrum*	
		28 DAA		42 DAA		28 DAA		42 DAA	
		2017-18	2018-19	2017-18	2018-19	2017-18	2018-19	2017-18	2018-19
T_1. Untreated control	-	1.98 (3.5)	1.86 (3.0)	2.48 (5.8)	2.23 (4.5)	2.32 (5.0)	2.51 (6.0)	2.75 (7.3)	3.19 (10.0)
T_2. Triafamone 200 SC at 2-3 leaf stage of weed	30	1.48 (1.8)	1.31 (1.3)	1.92 (3.3)	1.73 (2.5)	1.92 (3.3)	2.06 (3.8)	2.39 (5.3)	2.54 (6.0)
T_3. Triafamone 200 SC at 2-3 leaf stage of weed	40	1.48 (1.8)	1.31 (1.3)	1.86 (3.0)	1.56 (2.0)	1.70 (2.5)	1.93 (3.3)	2.32 (5.0)	2.49 (5.8)
T_4. Triafamone 200 SC at 2-3 leaf stage of weed	50	1.48 (1.8)	1.31 (1.3)	1.79 (2.8)	1.64 (2.3)	1.70 (2.5)	1.76 (2.8)	2.22 (4.5)	2.31 (5.0)
T_5. Triafamone 200 SC at 2-3 leaf stage of weed	100	1.22 (1.0)	1.10 (0.8)	1.56 (2.0)	1.31 (1.3)	1.48 (1.8)	1.55 (2.0)	1.98 (3.5)	2.09 (4.0)
T_6. Pyrazosulfuron ethyl 10% WP	15	1.64 (2.3)	1.70 (2.5)	2.22 (4.5)	2.11 (4.0)	2.05 (3.8)	2.21 (4.5)	2.44 (5.5)	2.68 (6.8)
T_7. Triafamone 200 SC) at 0-3 DAT	30	1.56 (2.0)	1.31 (1.3)	2.04 (3.8)	1.56 (2.0)	1.70 (2.5)	1.85 (3.0)	2.10 (4.0)	2.21 (4.5)
T_8. Triafamone 200 SC) at 0-3 DAT	40	1.40 (1.5)	1.22 (1.0)	1.86 (3.0)	1.48 (1.8)	1.73 (2.5)	1.80 (2.8)	2.05 (3.8)	2.17 (4.3)
T_9. Triafamone 200 SC) at 0-3 DAT	50	1.48 (1.8)	1.18 (1.0)	1.73 (2.5)	1.27 (1.3)	1.79 (2.8)	1.73 (2.5)	2.11 (4.0)	2.06 (3.8)
T_{10}. Triafamone 200 SC) at 0-3 DAT	100	0.71 (0.0)	0.71 (0.0)	1.06 (0.8)	1.18 (1.0)	1.49 (1.8)	1.40 (1.5)	2.05 (3.8)	1.87 (3.0)
T_{11}. Pretilachlor 50% EC at 0-3 DAT	750	1.63 (2.3)	1.48 (1.8)	2.15 (4.3)	1.92 (3.3)	2.00 (3.5)	2.21 (4.5)	2.23 (4.5)	2.49 (6.0)
T_{12}. Farmer practice (two hand weedings)	-	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	1.18 (1.0)	1.10 (0.8)	1.35 (1.5)	1.18 (1.0)
T_{13}. Weed free	-	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)
SEm $\pm$	-	0.13	0.11	0.14	0.12	0.14	0.15	0.15	0.19
CD (P = 0.05)	-	0.38	0.30	0.41	0.35	0.39	0.44	0.42	0.54

Note: Data transformed to $\sqrt{x+0.5}$ transformations. Figures in parenthesis are original values

Table 3. Dry weight of total weeds (g m^{-2}) and weed control efficiency (%) at 42 days after herbicide application of transplanted Rice as influenced by weed management practices during *Rabi,* 2017-18 and *Kharif,* 2018-19

Treatments	Dose (g a.i. ha^{-1})	*Dry weight of total weeds		**Weed control efficiency	
		42 DAA		42 DAA	
		2017-18	2018-19	2017-18	2018-19
$T_{1.}$ Untreated control	-	15.35 (235.4)	13.98(195.9)	0.00 (0.0)	0.00 (0.0)
$T_{2.}$ Triafamone 200 SC at 2-3 leaf stage of weed	30	9.87 (98.5)	9.67 (93.1)	49.54 (57.7)	46.05 (51.8)
$T_{3.}$ Triafamone 200 SC at 2-3 leaf stage of weed	40	8.51 (72.0)	8.72 (75.7)	56.34 (69.3)	50.88 (60.0)
$T_{4.}$ Triafamone 200 SC at 2-3 leaf stage of weed	50	8.01 (64.1)	7.98 (63.3)	58.54 (72.7)	54.98 (66.9)
$T_{5.}$ Triafamone 200 SC at 2-3 leaf stage of weed	100	6.83 (46.5)	7.19 (51.2)	63.60 (80.1)	59.02 (73.4)
$T_{6.}$ Pyrazosulfuron ethyl 10% WP	15	9.96 (99.2)	10.28 (105.8)	49.32 (57.4)	42.53 (45.7)
$T_{7.}$ Triafamone 200 SC) at 0-3 DAT	30	9.53 (90.6)	8.46 (71.2)	51.58 (61.3)	52.77 (63.4)
$T_{8.}$ Triafamone 200 SC) at 0-3 DAT	40	8.58 (73.4)	7.84 (61.2)	56.01 (68.7)	55.65 (68.0)
$T_{9.}$ Triafamone 200 SC) at 0-3 DAT	50	7.59 (57.1)	7.19 (51.2)	60.35 (75.4)	59.06 (73.5)
$T_{10.}$ Triafamone 200 SC) at 0-3 DAT	100	5.61 (31.1)	6.79(45.8)	68.64 (86.7)	60.83 (76.1)
$T_{11.}$ Pretilachlor 50% EC at 0-3 DAT	750	10.13 (102.7)	10.14(103.1)	48.32 (55.7)	43.37 (47.2)
$T_{12.}$ Farmer practice (two hand weedings)	-	3.63 (13.2)	3.71 (13.3)	76.56 (94.4)	74.78 (93.0)
$T_{13.}$ Weed free	-	0.71 (0.0)	0.71 (0.0)	90.00 (100.0)	90.00 (100.0)
SEm $\pm$	-	0.35	0.29	1.70	1.47
CD (P = 0.05)	-	1.01	0.84	4.87	4.23

*Note: *Data transformed to $\sqrt{x+0.5}$ transformations. Figures in parenthesis are original values ** Data transformed to arc sine transformations. Figures in parenthesis are original values*

The evaluation of weed control treatments was performed at the crop maturity stage. Random quadrates (0.25 m²) were placed within each plot to measure weed density. Weed population within these quadrates were counted and treatment efficacy was assessed by comparing the density against the untreated control. The weeds were harvested at ground level, the adhered soil was cleaned from weeds with tap water, dried in an oven at 70°C for 48 hours, and weighed to determine biomass. The data on weeds were transformed by square root transformation by adding one before being subjected to ANOVA (Gomez and Gomez 1984).

Weed control efficiency (WCE) indicates the percent reduction in weed dry matter due to weed control treatments over unweeded control. Based on dry matter of weeds produced at 42 days after application, the WCE was calculated by using the following formula and expressed in percentage (AICRPWC, 1988).

$$\mathrm{WCE}\ (\%) = \frac{\mathrm{DWC} - \mathrm{DWT}}{\mathrm{DWC}} \mathrm{x}100$$

Where,

DWC = Dry weight of weeds in unweeded control
DWT = Dry weight of weeds in treated plot

3. RESULTS AND DISCUSSION

3.1 Weed Flora in Transplanted Rice

The experimental field exhibited a diverse range of weed species during the investigation. The dominant grass species included *Echinochloa colonum*, *Echinochloa crusgalli*, *Dinebra retroflexa*, and *Leptochloa chinensis*. Among the sedges, *Cyperus rotundus* and *Cyperus difformis* were observed, while the broad-leaved weed species comprised *Eclipta alba*, *Ammania baccifera* and *Trianthema portulacastrum*. Among these, *Echinochloa colonum* emerged as the most prevalent weed across all three groups during various stages of crop growth in both years of the study (Basu et al., 2020).

3.2 Weed Density (No. m^{-2})

Weed density was notably influenced by the weed management treatments applied. At 28 days after herbicide application (DAA), significant reductions in the density of grasses (*Dinebra retroflexa*), sedges (*Cyperus rotundus* and *Cyperus difformis*) and broad-leaved weeds (*Eclipta alba*, *Ammania baccifera* and *Trianthema portulacastrum*) were observed across all treated plots compared to the untreated control. Among the herbicide management practices, lower weed density was observed in Triafamone 200 SC @ 100 g a.i. ha^{-1} applied at 2-3 days after transplanting (T_{10}), which performed on par with treatments such as T_5, T_9, and T_4. Conversely, the untreated control (T_1) consistently showed the highest weed densities.

At 42 DAA, significant reductions in weed density continued to be evident in all treated plots. The weed-free treatment (T_{13}) resulted in the lowest densities overall. However, among herbicide-treated plots, T_{10} achieved the most notable reduction, followed closely by T_5, T_9, and T_4, which exhibited similar results. The untreated control (T_1) maintained the highest weed density, reinforcing the effectiveness of weed management treatments in reducing weed population and competition during both years of the study. The results of this research correspond closely with the findings of (Jyothi Basu et al., 2023a,), underscoring analogous trends in herbicide efficacy and crop yield."

3.3 Weed Dry Matter

Weed dry matter is considered a more reliable parameter than weed density for evaluating weed competition, as it accurately reflects weed growth and resource depletion. Among all the weed management practices, the weed-free treatment (T_{13}) recorded the lowest weed dry matter at 42 DAA, while the untreated control (T_1) showed significantly higher weed dry matter compared to all other treatments during both years.

At 42 DAA, the treatment T_{10} (Triafamone 200 SC @ 100 g *a.i.* ha^{-1} at 2-3 DAT) achieved the lower values of weed dry matter, and it was significantly lower than treatments *viz*., T_9, T_4, and T_8, but on par with treatment T_5. However, none of the treatments matched the performance of the weed-free control (T_{13}) in reducing total weed dry matter. All weed management treatments were, nonetheless, significantly superior to the untreated control (T_1) in minimizing weed dry matter. "The observed results corroborate the conclusions of (Jyothi Basu et al., 2023a), emphasizing similar patterns in managing weeds and improving productivity."

3.4 Weed Control Efficiency (%)

The weed control efficiency (WCE) of various weed management treatments was assessed at

42 days after herbicide application (DAA) during both years of the study, as presented in Table 3.

At 42 DAA, the highest weed control efficiency was observed in treatment T_{10}, recording 68.64% during *Rabi,* 2017-18 and 60.83% during *Kharif,* 2018-19. This treatment performed on par with T_5, which achieved 63.60% and 59.02% WCE in the respective seasons. Both treatments significantly outperformed over the remaining weed management practices in reducing weed infestation during the study period. The findings align with those reported by Jyothi Basu et al., (2023a) showcasing comparable outcomes in weed control efficiency and crop yield enhancement.

4. CONCLUSION

Based on the findings of this study, it can be concluded that the weed spectrum in the transplanted Rice crop was predominantly composed of grasses, followed by broad-leaved weeds and sedges. The applied weed management practices demonstrated significant effectiveness in controlling grasses, broad-leaved weeds and sedges, thereby reducing competition for essential growth resources.

Among the herbicide treatments evaluated, Triafamone 200 SC @ 100 g a.i. ha^{-1} applied at 2-3 days after transplanting (T_{10}) was the most effective in suppressing grasses (*Dinebra retroflexa*), sedges (*Cyperus rotundus* and *Cyperus difformis*), and broad-leaved weeds (*Eclipta alba*, *Ammania baccifera*, and *Trianthema portulacastrum*). This treatment performed comparably to T_5 (Triafamone 200 SC @ 100 g a.i. ha^{-1} at 2-3 leaf stage of weed), T_9 (Triafamone 200 SC @ 100 g a.i. ha^{-1} at 2-3 DAT), and T_4 (Triafamone 200 SC @ 50 g a.i. ha^{-1} at 2-3 leaf stage of weed).

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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