Indian Journal of Weed Science (2026) **58**(1): 115–118
http://dx.doi.org/10.5958/0974-8164.2026.00016.0

**RESEARCH NOTE**

# Effect of different weed management methods on weed control and yield of wet-seeded rice seeded by drum seeder

**A. Mohammed Ashraf*, S. Saravana Perumal and Arya Suresh**

Received: 28 August 2025 | Revised: 9 November 2025 | Accepted: 13 November 2025

**ABSTRACT**

The aim of this study was to evaluate the effectiveness of sequential herbicide applications in combination with mechanical and manual weeding in wet-seeded rice (WSR) seeded by drum seeder during the *Navarai* season (January - April, 2025) at SRM College of Agricultural Sciences, Tamil Nadu, India. A Randomized Block Design replicated three times was used. The sequentially applied pre-emergence application (PE) of bensulfuron-methyl + pretilachlor 660 g/ha followed by (*fb*) post-emergence application (PoE) of florpyrauxifen-benzyl + cyhalofop-butyl 150 g/ha recorded the lowest weed density and biomass at all the recorded dates of 20, 40, 60 days after seeding (DAS) with highest weed control efficiency (82.4%), grain yield and straw yield of WSR seeded by drum seeder.

**Keywords:** Drum seeder, Bensulfuron-methyl + pretilachlor, Trifamone + ethoxysulfuron, Florpyrauxifen-benzyl + cyhalofop-butyl, Paddy power weeder, Wet-seeded rice

Rice, the staple food for most of the world's population. Globally, approximately 168.36 million hectares are cultivated with rice, yielding around 799.99 million tons, with an average productivity of 4.7 t/ha (FAOSTAT 2023). In India, rice is highly significant, covering 47.82 million hectares and producing 137.82 million tons, with an average yield of 2.8 t/ha. In Tamil Nadu, rice cultivation spans 21.01 lakh hectares, resulting in a production of 67.99 lakh tons and a productivity rate of 3.2 t/ha (Indiastat 2024). In direct-seeded rice under puddled conditions *i.e.* wet-seeded rice (WSR), most yield reduction is primarily caused by grasses, followed by sedges and broad-leaved weeds (Rathika *et al.* 2020). Weeds are the main barrier to achieving desirable yields in direct-seeded rice (DSR), causing about 50-100% production loss (Rao *et al*. 2007; Verma *et al.* 2023). Consequently, farmers have gradually adopted mechanical and chemical weed management practices, which are cost-effective, require less labor, and are minimally time-consuming (Rao et al. 2017). Herbicides are the effective and economic option for weed management in rice (Sekhar *et al.* 2020)

Integrated weed management with herbicides as component in WSR provides a better alternative solution for cost-effective and timely weed control (Kachroo and Bazaya 2011, Sivasakthi *et al.* 2024). Herbicides with a single mode of action are often ineffective against diverse weed populations. A single herbicide application is frequently insufficient due to the variety of weed species and the risk of herbicide resistance. Therefore, sequential applications of pre- and post-emergence herbicides with different modes of action, combined with manual or mechanical weeding, can effectively manage a wide range of weeds and delay resistance development (Gogoi and Deka 2023). To prevent residue accumulation, shifts in weed flora, and the development of herbicide-resistant weeds, it is recommended to use a variety of herbicides with different compositions that have proven effective in controlling weeds in rice fields (Sekhar *et al.* 2020). The aim of this study was to evaluate the effectiveness of sequential herbicide applications in combination with mechanical and manual weeding in managing weeds and improve productivity of wet-seeded rice (WSR) seeded by drum seeder.

A field experiment was conducted during the *Navarai* season (January - April) of 2025 at the wetland farm of SRM College of Agricultural Sciences, Baburayanpettai, Chengalpattu. Located in Tamil Nadu's Northeastern agro-climatic zone at 12.38° N latitude, 79.73° E longitude, and 50 m above mean sea level. The soil of the experimental field was sandy loam, with low available nitrogen (213.4 kg/ha) and phosphorus (5 kg/ha), medium available

Department of Agronomy, SRM College of Agricultural Sciences, SRM Institute of Science and Technology, Chengalpattu, Baburayanpettai, Tamil Nadu 603201, India

* Corresponding author email: ashrafbsa09040@gmail.com

potassium (140 kg/ha), a pH of 7.5, and an organic carbon content of 0.24%. The short-duration rice variety CO 55 was used as the test variety. The experiment was conducted in a Randomized Block Design (RBD) with three replications. The tested treatment include: pre-emergence application (PE) of bensulfuron-methyl + pretilachlor 660 g/ha on 3 days after seeding (DAS) followed by (*fb*) hand weeding on 40 DAS; bensulfuron-methyl + pretilachlor 660 g/ha PE on 3 DAS *fb* weeding with power weeder on 40 DAS; bensulfuron-methyl + pretilachlor 660 g/ha PE on 3 DAS *fb* post-emergence application (PoE) of florpyrauxifen-benzyl + cyhalofop-butyl 150 g/ha on 25 DAS; early post emergence application (EPoE) of triafamone + ethoxysulfuron 67.5 g/ha on 10 DAS *fb* hand weeding on 40 DAS; triafamone + ethoxysulfuron 67.5 g/ha EPoE on 10 DAS *fb* weeding with power weeder on 40 DAS; triafamone + ethoxysulfuron 67.5 g/ha EPoE on 10 DAS *fb* florpyrauxifen-benzyl + cyhalofop-butyl 150 g/ha on 25 DAS; pretilachlor 500 g/ha PE on 3 DAS *fb* hand weeding on 40 DAS weeding with power weeder 20 DAS and 40 DAS; hand weeding twice 20 DAS and 40 DAS and weedy check control (Unweeded check). All cultural practices, excluding weed management, were followed as per the Crop Production Guide (CPG 2020) recommendations. Data were statistically analyzed as suggested by Gomez and Gomez (1984). Percentage values were angularly transformed, and weed counts used the ($\sqrt{x+0.5}$) transformation before analysis.

**Effect on weeds**

The experimental field contained a mixed population of weed species, including grass, sedges and broad-leaved weeds. The dominant grasses were *Echinochloa colona*, *Echinochloa crus-galli* and *Chloris barbata;* sedges included *Cyprus rotundas* and *Cyprus difformis*, while broad-leaved weeds consisted of *Ammania baccifera, Eclipta alba, Marsilea quadrifolia* and *Phyllanthus niruri*

The lower density, weed intensity and biomass was recorded at 40, 60 DAS with hand weeding twice followed by bensulfuron methyl + pretilachlor 660 g/ha PE *fb* hand weeding on 40 DAS, and bensulfuron methyl + pretilachlor PE *fb* florpyrauxifen-benzyl + cyhalofop-butyl PoE and bensulfuron-methyl + pretilachlor PE *fb* weeding with power weeder on 40 DAS (**Table 1**). These results are in agreement with Nagarjun *et al.* (2019).

Pretilachlor PE effectively controlled grass weeds broad-leaved weeds and sedges early in crop growth. A reduction in weed density was noted with the use of florpyrauxifen-benzyl + cyhalofop-butyl mixtures rather than a single herbicide. This could be attributed to the efficient management of a diverse range of weed species through two distinct modes of

**Table 1. Effect of weed management treatments on total weed density, weed intensity, total weed dry weight, weed control efficiency at 60 DAS in wet-seeded rice**

| Treatment | Total weed density (no./m$^2$) | | | Weed intensity (%) | Total weed biomass (g/m$^2$) | | | Weed control efficiency (%) |
|---|---|---|---|---|---|---|---|---|
| | Grasses | Sedges | BLW | | Grasses | Sedges | BLW | |
| Bensulfuron methyl + pretilachlor 660 g/ha PE *fb* hand weeding on 40 DAS | 5.07 (20.90) | 4.69 (17.74) | 5.13 (21.67) | 54.67 | 18.37 | 11.70 | 19.14 | 71.66 |
| Bensulfuron methyl + pretilachlor 660 g/ha PE *fb* weeding with power weeder on 40 DAS | 5.89 (29.28) | 5.44 (24.44) | 6.15 (31.94) | 63.13 | 29.73 | 15.82 | 28.10 | 59.62 |
| Bensulfuron methyl + pretilachlor 660 g/ha PE *fb* Florpyrauxifen-benzyl + cyhalofop-butyl 150 g/ha PoE | 3.97 (12.00) | 3.87 (11.42) | 4.27 (14.22) | 42.94 | 11.72 | 7.80 | 12.44 | 82.40 |
| Trifamone + Ethoxysulfuron 67.5 g/ha EPoE *fb* hand weeding on 40 DAS | 5.09 (21.14) | 4.85 (18.93) | 5.29 (23.05) | 55.75 | 20.27 | 12.35 | 20.27 | 70.12 |
| Trifamone + ethoxysulfuron 67.5 g/ha EPoE *fb* weeding with power weeder on 40 DAS | 6.49 (35.95) | 5.49 (25.03) | 6.62 (37.54) | 66.31 | 31.73 | 17.10 | 29.84 | 53.51 |
| Trifamone + ethoxysulfuron 67.5 g/ha EPoE *fb* florpyrauxifen-benzyl + cyhalofop-butyl 150 g/ha PoE | 4.70 (17.66) | 4.51 (16.51) | 4.86 (19.04) | 51.34 | 16.44 | 9.52 | 17.10 | 74.99 |
| Pretilachlor 500 g/ha PE *fb* hand weeding on 40 DAS | 5.45 (24.47) | 4.94 (19.79) | 5.45 (24.65) | 57.82 | 21.85 | 13.43 | 21.75 | 68.00 |
| Weeding with power weeder 20 DAS and 40 DAS | 6.82 (40.03) | 6.07 (31.05) | 6.65 (37.87) | 68.51 | 38.29 | 20.80 | 33.93 | 48.54 |
| Hand weeding twice 20 DAS and 40 DAS | 5.50 (25.03) | 5.27 (22.76) | 5.82 (28.28) | 60.34 | 23.75 | 14.30 | 23.14 | 64.26 |
| Weedy check control | 9.04 (73.47) | 8.44 (63.46) | 9.38 (78.98) | 81.02 | 74.67 | 41.99 | 62.64 | 0.00 |
| LSD (p=0.05) | 0.57 | 0.56 | 0.55 | 6.51 | 4.57 | 1.43 | 4.37 | |

* Data is subjected to square root transformation. Values in the parenthesis are original; PE – pre-emergence application, PoE – post-emergence application, EPoE - early post-emergence application, *fb* - followed by, BLW = broad-leaved weeds, DAS - days after seeding

action. The weedy check control recorded greater density of grasses, sedges, and broad-leaved weeds due to uncontrolled and enhanced growth of weeds.

At 20 DAS, hand weeding twice recorded the highest weed control efficiency (82.87%), followed by bensulfuron-methyl + pretilachlor (PE) *fb* hand weeding on 40 DAS (77.73%) highlighting their efficacy of early weed suppression. At 40 and 60 DAS, bensulfuron-methyl + pretilachlor 660 g/ha PE *fb* PoE florpyrauxifen-benzyl + cyhalofop-butyl exhibited the highest weed control efficiency (83.04% and 82.40%), indicating persistent weed suppression over time. The triafamone + ethoxysulfuron EPoE *fb* florpyrauxifen-benzyl + cyhalofop-butyl PoE also recorded higher weed control efficiencies of 76.65% and 74.99%, making it the second most effective option.

The application of bensulfuron methyl + pretilachlor PE *fb* florpyrauxifen-benzyl + cyhalofop-butyl PoE effectively managed weeds due to application of herbicides at initial and later stages of crop growth. The pre-emergence application of herbicides effectively managed the early stages of weed growth, while post-emergence application of herbicides controlled them at later stages. Application of flopyrauxifen-benzyl + cyhalofop-butyl resulted in increased weed control efficiency (Perumal e*t al.* 2025a). This could be attributed to the effective management of weeds during the crucial period of their competition. These observations align with the results reported by Munnoli *et al*. (2018) (**Table 1**)

**Effect on rice yield and economics**

The highest grain yield of WSR was achieved by applying bensulfuron methyl + pretilachlor PE *fb* florpyrauxifen-benzyl + cyhalofop-butyl PoE (**Table 2)** due to the broad-spectrum and effective weed control provided by these herbicides as reported by Yogananda et al. (2021) and Perumal e*t al.* (2025b).

The cost of cultivation, gross return, net return, and benefit-cost (B:C) ratio in WSR with different weed management treatments varied **(Table 2)**. The highest cost was with hand weeding twice due to higher labour requirements, followed by triafamone + ethoxysulfuron 67.5 g/ha EPoE *fb* hand weeding owing to combined use of herbicides and manual weeding.

The highest gross return, net return and B:C ratio in wet-seeded rice were recorded with bensulfuron-methyl + pretilachlor 660 g/ha PE *fb* florpyrauxifen-benzyl + cyhalofop-butyl 150 g/ha PoE and next highest gross return, net return and B:C ratio were recorded was observed with triafamone + ethoxysulfuron 67.5 g/ha EPoE *fb* florpyrauxifen-benzyl + cyhalofop-butyl PoE. The weedy check had the lowest gross income, net income and lowest B:C ratio due to greater weed competition.

**Table 2. Effect of different weed management treatments on grain yield, straw yield, harvest index and economics of wet-seeded rice**

| Treatment | Grain yield | Straw yield | Harvest index | Total cultivation cost (₹/ha) | Net income (₹/ha) | B:C Ratio |
|---|---|---|---|---|---|---|
| Bensulfuron-methyl + pretilachlor 660 g/ha PE *fb* hand weeding on 40 DAS | 4772 | 6346 | 0.43 | 59149 | 67370 | 2.13 |
| Bensulfuron methyl + pretilachlor 660 g/ha PE *fb* weeding with power weeder on 40 DAS | 4012 | 5697 | 0.41 | 52299 | 45500 | 1.86 |
| Bensulfuron-methyl + pretilachlor 660 g/ha PE *fb* florpyrauxifen-benzyl + cyhalofop-butyl 150 g/ha PoE | 5550 | 7215 | 0.44 | 56449 | 97053 | 2.71 |
| Trifamone + ethoxysulfuron 67.5 g/ha EPoE *fb* hand weeding on 40 DAS | 4440 | 5949 | 0.43 | 60274 | 59662 | 1.98 |
| Trifamone + ethoxysulfuron 67.5 g/ha EPoE *fb* weeding with power weeder on 40 DAS | 3862 | 5599 | 0.41 | 53424 | 37774 | 1.70 |
| Trifamone + ethoxysulfuron 67.5 g/ha EPoE *fb* florpyrauxifen-benzyl + cyhalofop-butyl 150 g/ha PoE | 5128 | 6720 | 0.43 | 57574 | 82932 | 2.44 |
| Pretilachlor 500 g/ha PE *fb* hand weeding on 40 DAS | 4262 | 5711 | 0.43 | 57849 | 54426 | 1.94 |
| Weeding with power weeder 20 DAS and 40 DAS | 3312 | 4968 | 0.40 | 51399 | 33513 | 1.65 |
| Hand weeding twice 20 DAS and 40 DAS | 4110 | 5671 | 0.42 | 65099 | 40255 | 1.61 |
| Weedy check control | 1246 | 2055 | 0.38 | 47599 | -14517 | 0.69 |
| LSD (p=0.05) | 333 | 483 | NS | | | |

* PE – pre-emergence application, PoE – post-emergence application, EPoE - early post-emergence application, *fb* - followed by, DAS = days after seeding

Based on this study, sequential application of bensulfuron-methyl + pretilachlor PE *fb* florpyrauxifen-benzyl + cyhalofop-butyl PoE proved to be the effective and economic option to manage weeds in wet-seeded rice seeded by drum seeder.

## REFERENCES


FAO. 2023. FAOSTAT Statistical Database. Accessed on 04 August 2024.

Gogoi B and Deka J. 2023. Effect of integrated weed-management practices in direct-seeded autumn rice (Oryza sativa L.) on growth, yield and soil microflora. *Indian Journal of Agronomy* **68**(2): 140–146.

Gomez KA. 1984. Statistical procedures for agricultural research.2nd Edn. John Wiley and Sons. New York. U. S. A

Indiastat. 2024. *Statistical Database*. *Agricultural production and productivity.*

Kachroo D and Bazaya BR. 2011. Efficacy of different herbicides on growth and yield of direct wet seeded rice sown through drum seeder. *Indian Jornal of Weed Science* **43**(1&2): 67–69.

Munnoli S, Rajakumar D, Chinnusamy C and Thavaprakaash N. 2018. Integrated weed management in aerobic rice. *Madras Agricultural Journal* **105**(1): 1–3.

Perumal SS, Ashraf AM, Ramadass S, Anbukkarasi K, Vanitha J, Suresh A and Sree VS. 2025a. Assessment of Weed Dynamics and Crop Response Through Integrated Weed Management Strategies in Drum Seeded Rice.*Agricultural Science Digest*. 1-7**.** doi: 10.18805/ag.D-6387

Perumal SS, Ashraf AM, Ramadass S and Chandrasekaran P. 2025. Investigating the impact of integrated weed management practices on weed control and productivity in drum seeded rice (DSR). *International Journal of Research in Agronomy* **8**(7): 1545–1548.

Rao AN, Johnson DE, Sivaprasad B, Ladha JK and Mortimer AM. 2007. Weed management in direct-seeded rice. *Advances in Agronomy* **93**: 155–257.

Rao AN, Wani SP, Ahmed S, Ali H and Marambe B. 2017. An overview of weeds and weed management in rice of South Asia. pp. 247 to 281. In: (Eds. Rao AN and Matsumoto H), Weed management in rice in the Asian-Pacific region. Asian-Pacific Weed Science Society (APWSS); The Weed Science Society of Japan, Japan and Indian Society of Weed Science, India.

Rathika S, Ramesh T and Shanmugapriya P. 2020. Weed management in direct seeded rice: A review. *International Journal of Chemical Studies* **8**(4): 925–933.

Sekhar L, Ameena M. and Jose N. 2020. Herbicides and herbicide combinations for management of Leptochloa chinensis in wet-seeded rice. *Indian Journal of Weed Science* **52**(3): 211–21

Sivasakthi D, Saravanane P, Sridevi V and Coumaravel K. 2024. Effect of 2,4-D dose and formulation for brown manuring on weed dynamics, yield and economics in wet seeded rice. *Indian Journal of Weed Science* **56**(2): 124–127

Subramanian E, Martin GJ and Balasubramanian R. 2006. Effect of integrated weed-management practices on growth and yield of wet-seeded rice (*Oryza sativa* L.*)* and their residual effect on succeeding pulse crop. *Indian Journal of Agronomy* **51**(2): 93–96.

Verma B, Bhan M, Jha AK, Agrawal KK, Kewat ML and Porwal M. 2023. Weed management in direct-seeded rice (*Oryza sativa* L.) in central India. *Indian Journal of Agronomy* **68**(2): 211–212

Yogananda SB, Thimmegowda P and Shruthi GK. 2021. Weed management in wet (drum)-seeded rice under Southern dry zone of Karnataka. *Indian Journal of Weed Science* **53**(2): 117–122.