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Response of dry direct seeded rice to sequential application of herbicide combinations

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Abstract

A field experiment was conducted during Kharif, 2022, Institute of Rice Research, Rajendranagar, Hyderabad in Telangana state. Fourteen weed management practices were evaluated in a randomized complete block design, replicated thrice. The lower weed dry weight at 60 DAS, number of panicles/m² and grain yield was observed with T₁₃- Mechanical/ Hand weeding at 20, 40, 60 DAS (2.2) it was statistically on par with T₁₁- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE weed followed by mechanical weeding at 40-45 DAS. T₅- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS, T₉- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS, T₂- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 g/ha (Ready mix) PoE at 2-4 leaf stage of the weed followed by mechanical weeding at 40-45 DAS, T₃- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS.

Keywords: Grain yield, herbicide combinations, productivity, dry direct seeded rice, weed density and weed dry weight

Introduction

Rice is global grain and world most important food crop. To maintain the food security of Asia, its cultivation is crucial as more than 90% of rice production and consumption is in this continent. Rice contributes 32-59% of the dietary energy and 25-44% of the dietary protein in 39 countries. The projected demand for rice is to be increased by 70% in next 30 years to maintain present per capita availability (69 kg/annum) considering the productivity of land constant.

In India, major rice producing states are Uttar Pradesh, Telangana, West Bengal, Punjab, Chhattisgarh, Odisha and Andhra Pradesh etc., (www.indiastat.com, 2022-2023). In many Asian countries, growers recently started to shift their rice cultivation practices from traditional puddled rice to dry seeded rice. In India, dry sown (semi dry) system of rice cultivation is a unique and extensively adopted system in 20% rice growing area. In Kerala, it constitutes greater than 60% of area under rice during kharif. In this system, rice is grow in a dry soil environment up to 30-40 days and there after that the field gets submerged with onset of South West monsoon. Direct seeding of rice helps not only to meet challenges posed by water and labour shortage but also time and edaphic conflicts and it promises system sustainability. In water scarcity conditions, semidry system of rice is better option until canal water for irrigation becomes available. However, dry direct seeding of rice (DSR) is possible only if there is better crop establishment as well as adequate weed control practices to keep the field weed free.

Dry tillage practices and absence of stagnant water during initial 4-6 weeks are more favorable for germination and growth of highly competitive weeds like *Echinochloa sp.*, *Cyperus difformis* and *Fimmbristylis miliacea*.

Manual weeding is not preferred now a days because of labour scarcity at critical time of weeding and increasing labour costs. Manual weeding is not much effective in controlling the weeds in DSR because during initial stages of development, we cannot distinguish between weeds and crop, making hand weeding a difficult task. New generation herbicides which are applied at very low doses are more effective with low mammalian toxicity and reduced the risk of environmental pollution. Several new generation pre-emergence herbicides alone or supplemented with mechanical weeding have been reported to provide a fair degree of weed control (Pellerin and Webster, 2004) [8]. The aim of this study was to increase the efficiency of weed management by the selection of proper pre and post emergence herbicides in combination with mechanical weeding.

Materials and Methods

The investigation was carried out during *kharif* 2022 at Institute of Rice Research, Professor Jayashankar State Agricultural university, Rajendranagar, Hyderabad, situated at an altitude of 542.3 m above MSL at 17°19' N latitude and 78°23' E longitude. It is in the Southern Telangana agro-climatic zone of Telangana state. According to Troll's climatic classification, it falls under semi-arid tropics (SAT). During the cropping period rainfall of 861.1 mm was received. RNR 29325 (Rajendranagar 5) is short duration rice variety matures in 125 days. It has long slender grains and moderate resistance to BPH and leaf blast. Experiment consist of 14 treatments consisting of pre emergence application of Pendimethalin 38.7% CS 677.25 g/ha, Pyrazosulfuron ethyl 10% WP 20 g/ha and Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) followed by post emergence application of Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix), Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 g/ha (Ready mix), Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) and Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix), followed by mechanical weeding at 40-45 DAS in herbicide treated plots, weed free treatment i.e., hand weeding twice at 25 and 45 DAT and weedy check in RBD replicated thrice.

Weed density (No. m⁻²)

Weed density was taken at 20, 40 and 60 DAS in randomly selected quadrat (0.5 x 0.5 m²) in each plot and were separated and expressed as number m⁻². The sampling was done outside the net plot but within the gross plot.

Weed dry weight (g m⁻²)

The weeds collected from randomly selected quadrat (0.5 m x 0.5 m) at 20, 40 and 60 DAS, sampling was used to estimate the dry matter of weeds. The weeds were initially sun dried after removing the root portion, followed by oven drying at 74°C to a constant weight. The sampling was done outside the net plot but within the gross plot.

Results and discussions

Total weed density (No.m⁻²) at 20 DAS

Data pertaining to Total weed density (No.m⁻²) at 20 DAS under different weed management practices was analysed statistically and presented in table 1. At 20 DAS, the lower total weed density was observed with T₉- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at

40-45 DAS (4.2) it was statistically on par with T₁₃- Mechanical/ Hand weeding at 20, 40, 60 DAS (4.2), T₁- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (4.5) it was inturn on par with T₁₁- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE weed followed by mechanical weeding at 40-45 DAS (4.8) it was inturn on par with T₃- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (5.1), T₆- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 h/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (5.0), T₇- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (5.2), T₁₀- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 h/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (5.3), it was inturn on par with T₂- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 g/ha (Ready mix) PoE at 2-4 leaf stage of the weed followed by mechanical weeding at 40-45 DAS (5.7), T₈- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (5.6), T₁₂- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40- 45 DAS (5.8) it was inturn on par with T₄- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (5.9) it was followed by T₅- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (6.6). The highest total weed density was observed with T₁₄- Unweeded control (8.1).

Total weed density (No m⁻²) at 40 DAS

Data pertaining to Total weed density (No.m⁻²) at 40 DAS under different weed management practices was analysed statistically and presented in Table 1. At 40 DAS, the lower total weed density was observed with T₁₃- Mechanical/ Hand weeding at 20, 40, 60 DAS (2.6) it was statistically on par with T₁₁- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE weed followed by mechanical weeding at 40-45 DAS (3.1), T₅- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (3.4) and it was inturn on par with T₉- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (3.6), T₂-

Pendimethalin 38.7% CS 677.25 g/ha PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 g/ha (Ready mix) PoE at 2-4 leaf stage of the weed followed by mechanical weeding at 40-45 DAS(3.7), T₃- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (3.7), T₆- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 h/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS(3.7), T₇- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS(3.8), T₁₂- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40- 45 DAS(4.0) and T₁₀- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 h/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (4.2) it was inturn on par with T₁- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS(4.6), T₈- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (4.8). The highest total weed density was observed with T₁₄- Unweeded control (10.8).

Total weed density (No m⁻²) at 60 DAS

Data pertaining to Total weed density (No.m⁻²) at 60 DAS under different weed management practices was analysed statistically and presented in table 1. At 60 DAS, the lower total weed density was observed with T₁₁- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE weed followed by mechanical weeding at 40-45 DAS (2.5) it was statistically on par with T₁₃- Mechanical/ Hand weeding at 20, 40, 60 DAS (2.6), T₉- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (2.7), T₅- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (3.2) it was inturn on par with T₂- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 g/ha (Ready mix) PoE at 2-4 leaf stage of the weed followed by mechanical weeding at 40-45 DAS(3.8) it was followed by T₃- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (5.0) it was statistically on par with T₆- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 h/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS(5.4), T₇- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (5.5), it was inturn on par with T₁₂- Pendimethalin

38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40- 45 DAS(6.1), it was on par with T₄- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (6.8), T₁₀- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 h/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (6.9) it was inturn on par with T₁- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (7.5). The highest total weed density was observed with T₁₄- Unweeded control (12.4).

The study revealed that at all stages of observation, weedy check recorded the maximum number of weed population indicating the native soil is full of weed seeds. All herbicidal treatments reduced weed population significantly compared with weedy check. Hand weeding was more efficient to destroy all groups of weeds. All sequential application of herbicides recorded lesser number of weeds reflecting its high bioefficacy in controlling and suppressing weed growth than single application of any one herbicide corroborating the findings of Spandana *et al.* (2024).

Weed dry weight (g/m²) at 20 DAS

At 20 DAS (Table 2), the lower weed dry weight was observed with T₁₃- Mechanical/ Hand weeding at 20, 40, 60 DAS (2.2), it was followed by T₁- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS(2.7),T₉- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (2.7) it was followed by T₁₀- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 h/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (3.0), T₂- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 g/ha (Ready mix) PoE at 2-4 leaf stage of the weed followed by mechanical weeding at 40-45 DAS(3.1), T₃- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (3.1), T₁₁- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE weed followed by mechanical weeding at 40-45 DAS(3.1) it was inturn on par with T₁₂- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS(3.3) it was on par with T₄- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (3.4), T₅- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (3.4), T₆-

Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 h/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS(3.4) and T₈- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (3.4) it was followed by T₇- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (3.7). The higher weed dry weight was observed with T₁₄- Unweeded control (5.0). (Dhanapal *et al.*, 2018).

Weed dry weight (g/m²) at 40 DAS

At 40 DAS (Table 2), the lower weed dry weight was observed with T₁₃- Mechanical/ Hand weeding at 20, 40, 60 DAS (2.1), it was statistically on par with T₁₁- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE weed followed by mechanical weeding at 40-45 DAS(2.6), T₅- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (2.7), T₉- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (2.9) it was followed by T₂- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 g/ha (Ready mix) PoE at 2-4 leaf stage of the weed followed by mechanical weeding at 40-45 DAS(3.1) it was on par with T₃- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (4.3), T₆- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 h/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS(4.4), T₇- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS(4.7), it was inturn on par with T₁₂- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS(4.9), T₄- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (5.1), T₁₀- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 h/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (5.3) it was inturn on par with T₁- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS(6.0) it is inturn on par with T₈- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (6.3). The highest weed dry weight was observed with T₁₄- Unweeded control (5.0).

Weed dry weight (g/m²) at 60 DAS

At 60 DAS (Table 2), the lower weed dry weight was observed with T₁₃- Mechanical/Hand weeding at 20, 40, 60 DAS (2.2) it was statistically on par with T₁₁- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE weed followed by mechanical weeding at 40-45 DAS(2.4), T₅- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (2.5), T₂- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 g/ha (Ready mix) PoE at 2-4 leaf stage of the weed followed by mechanical weeding at 40-45 DAS(2.6) it was inturn on par with T₃- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (2.7), T₉- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (2.7), T₆- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 h/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS(2.8), T₇- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS(4.7), it was inturn on par with T₄- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (3.1), T₁- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS(3.1), T₈- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (3.1), T₁₀- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 h/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (3.1), T₁₂- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (3.2). The highest weed dry weight was observed with T₁₄- Unweeded control (8.0).

In weedy check season long weed growth recorded the higher weed dry weight because of the absence of control measures, exploited the native and applied nutrients in greater amount beside enjoying the natural resources like sunlight etc. resulting in better weed growth for achieving higher dry weight production this again lead to poor growth and yield of the crop. However, in hand weeding plots less weed dry weight production was due to the destruction of weeds through weeding twice (Reddy *et al.*, 2012) ^[10]. Among the herbicide treated plots killing of germinating weed seeds as well as removal of established weeds resulting in lower dry weight of weeds, during early stages the less weed dry weight was observed in PE herbicide treated plots, as the crop growth stage advanced, the total weed dry weight gradually increased due to reduced efficacy of applied herbicides. During the critical period of crop

weed competition weed dry weight continuously remained increasing and crop growth affected due to competition from weeds for the natural resources (Parthipan and Ravi, 2014) [7].

Panicles /m² at harvest

Highest number of panicles/ m² at harvest (Table 3) were observed with T₁₃- Mechanical/ Hand weeding at 20, 40, 60 DAS (327) it was statistically on par with T₁₁- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE weed followed by mechanical weeding at 40-45 DAS (319), T₅- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (314), T₉- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (307), T₂- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 g/ha (Ready mix) PoE at 2-4 leaf stage of the weed followed by mechanical weeding at 40-45 DAS (300), T₃- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (293), it was inturn on par with T₆- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 h/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (279), T₈- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (305) T₄- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (273), T₁₀- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 h/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (272), T₁₂- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (264), T₇- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (250) it was inturn on par with T₁- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (247), T₁₄- Unweeded control (209), Ganai *et al.*, 2014 [4].

Panicle length (cm)

Data pertaining to panicle length under different weed management practices was analysed statistically and presented in Table 3. There was no significance difference in chaffy grains/panicle was observed with different weed management practices.

Panicle weight (g)

Data pertaining to panicle weight under different weed management practices was analysed statistically and presented

in Table 3. There was no significance difference in chaffy grains/panicle was observed with different weed management practices.

Filled grains/ panicle

Data pertaining to Filled grains/panicle under different weed management practices was analysed statistically and presented in table 3. There was no significance difference in chaffy grains/panicle was observed with different weed management practices.

Chaffy grains/ panicle

Data pertaining to chaffy grains/panicle under different weed management practices was analysed statistically and presented in table 3. There was no significance difference in chaffy grains/panicle was observed with different weed management practices.

Grain yield

The higher grain yield (Table 3) was observed with T₁₃- Mechanical/ Hand weeding at 20, 40, 60 DAS (3959) it was statistically on par with T₁₁- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE weed followed by mechanical weeding at 40-45 DAS (3795), T₅- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (3609), T₉- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (3570), T₂- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 g/ha (Ready mix) PoE at 2-4 leaf stage of the weed followed by mechanical weeding at 40-45 DAS (3568), T₃- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (3502), it was inturn on par with T₆- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 h/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (3463), T₇- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (3400), T₁₂- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (3355), T₄- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (3285), T₁₀- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 h/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (3167), T₁- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (3114), T₈- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD

25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (3068). The lower grain yields was observed with T₁₄- Unweeded control (1419), (Malik *et al.*, 2021, Pinjari *et al.*, 2016 and Sahu *et al.*, 2011) [5, 9, 11].

Straw yield

The higher straw yield (Table 3) was observed with T₁₃- Mechanical/ Hand weeding at 20, 40, 60 DAS (5876) it was statistically on par with T₁₁- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE weed followed by mechanical weeding at 40-45 DAS(5678), T₅- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (5320), T₉- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (5313), T₃- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (5202), T₂- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 g/ha (Ready mix) PoE at 2-4 leaf stage of the weed followed by

mechanical weeding at 40-45 DAS(5192), T₆- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 h/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS(5116) it was inturn on par with T₇- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (5074), T₁₂- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40- 45 DAS(4951), T₄- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (4861), T₁₀- Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 h/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS (4670), T₁- Pendimethalin 38.7% CS 677.25 g/ha PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS(4645), T₈- Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS (4475). Significantly lower straw yield was observed with T₁₄- Unweeded control (2235).

Table 1: Weed density (No/m²) at different stages as influenced by different weed management practices in Dry direct seeded rice during Kharif, 2022

Treatments	Weed density (No/m ²)		
	20 DAS	40 DAS	60 DAS
T1: Pendimethalin 38.7% CS 677.25 g/ha PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS	4.5 (19.3)	4.6 (20.3)	7.5 (55.0)
T2: Pendimethalin 38.7% CS 677.25 g/ha PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 g/ha (Ready mix) PoE at 2-4 leaf stage of the weed followed by mechanical weeding at 40-45 DAS	5.7 (31.0)	3.7 (13.0)	3.8 (14.0)
T3: Pendimethalin 38.7% CS 677.25 g/ha PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS	5.1 (25.3)	3.7 (13.0)	5.0 (23.7)
T4: Pendimethalin 38.7% CS 677.25 g/ha PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS	5.9 (33.3)	4.1 (16.0)	6.8 (45.7)
T5: Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS	6.6 (42.7)	3.4 (10.7)	3.2 (9.3)
T6: Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 h/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS	5.0 (23.7)	3.7 (13.0)	5.4 (28.7)
T7: Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS	5.2 (26.0)	3.8 (13.7)	5.5 (29.7)
T8: Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS	5.6 (30.0)	4.8 (22.0)	9.3 (86.3)
T9: Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS	4.2 (16.7)	3.6 (12.3)	2.7 (6.7)
T10: Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 h/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS	5.3 (27.0)	4.2 (16.7)	6.9 (47.3)
T11: Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE weed followed by mechanical weeding at 40-45 DAS	4.8 (22.0)	3.1 (8.7)	2.5 (5.3)
T12: Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS	5.8 (33.0)	4.0 (15.0)	6.1 (36.0)
T13: Mechanical/ Hand weeding at 20, 40, 60 DAS	4.2 (16.7)	2.6 (5.7)	2.6 (6.0)
T14: Unweeded control	8.1 (64.7)	10.8 (116.3)	12.4 (152.3)
S.E.M _±	0.16	0.29	0.31
CD (P=0.05)	0.5	0.8	0.9

Figures in parenthesis are original values

Table 2: Weed dry weight (g/m²) at 20, 40, 60 DAS influenced by different weed management practices in Dry direct seeded rice during Kharif, 2022

Treatments	20 DAS	40DAS	60DAS
T1: Pendimethalin 38.7% CS 677.25 g/ha PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS	2.7 (6.2)	6.0 (35.3)	3.1 (8.5)
T2: Pendimethalin 38.7% CS 677.25 g/ha PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 g/ha (Ready mix) PoE at 2-4 leaf stage of the weed followed by mechanical weeding at 40-45 DAS	3.1 (8.4)	3.9 (14.3)	2.6 (5.9)
T3: Pendimethalin 38.7% CS 677.25 g/ha PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS	3.1 (8.5)	4.3 (17.3)	2.7 (6.3)
T4: Pendimethalin 38.7% CS 677.25 g/ha PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS	3.4 (10.3)	5.1 (25.3)	3.1 (8.7)
T5: Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS	3.4 (10.4)	2.7 (6.3)	2.5 (5.3)
T6: Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 h/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS	3.4 (10.9)	4.4 (18.7)	2.8 (7.0)
T7: Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS	3.7 (12.9)	4.7 (21.0)	3.0 (8.3)
T8: Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS	3.4 (10.3)	6.3 (38.3)	3.1 (8.4)
T9: Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS	2.7 (6.1)	2.9 (7.3)	2.7 (6.1)
T10: Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 h/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS	3.0 (7.8)	5.3 (27.0)	3.1 (8.4)
T11: Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE weed followed by mechanical weeding at 40-45 DAS	3.1 (8.5)	2.6 (6.0)	2.4 (4.8)
T12: Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS	3.3 (10.2)	4.9 (23.0)	3.2 (9.0)
T13: Mechanical/ Hand weeding at 20, 40, 60 DAS	2.2 (4.0)	2.1 (3.3)	2.2 (4.0)
T14: Unweeded control	5.0 (23.7)	7.3 (52.0)	8.0 (63.9)
S.E.M +	0.1	0.3	0.13
CD (P=0.05)	0.2	0.8	0.4

Figures in parenthesis are original values

Table 3: Yield attributes and yield influenced by different weed management practices in Dry direct seeded rice during Kharif, 2022

Treatments	Panicles/m ²	Panicle Length (cm)	Panicle weight (g)	Filled grains/panicle	Chaffy grains/panicle	Grain Yield (kg/ha)	Straw Yield (kg/ha)
T1: Pendimethalin 38.7% CS 677.25 g/ha PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS	247	20.5	3.0	135	22.7	3114	4,645
T2: Pendimethalin 38.7% CS 677.25 g/ha PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 g/ha (Ready mix) PoE at 2-4 leaf stage of the weed followed by mechanical weeding at 40-45 DAS	300	21.1	3.2	133	14.7	3568	5,192
T3: Pendimethalin 38.7% CS 677.25 g/ha PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS	293	20.7	3.3	135	17.0	3502	5202
T4: Pendimethalin 38.7% CS 677.25 g/ha PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS	273	20.6	2.9	139	26.0	3285	4861
T5: Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS	314	21.6	3.2	138	12.0	3609	5320
T6: Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 h/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS	279	20.9	3.3	136	17.7	3463	5116
T7: Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS	250	20.4	3.2	133	21.3	3400	5074
T8: Pyrazosulfuron ethyl 10% WP 20 g/ha PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS	275	21.1	3.1	123	21.7	3068	4475
T9: Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS	307	21.3	3.5	137	10.7	3570	5313
T10: Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha	272	20.7	3.2	126	18.0	3167	4670

(Ready mix) PE followed by Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 g/ha (Ready mix) PoE followed by mechanical weeding at 40-45 DAS							
T ₁₁ : Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE weed followed by mechanical weeding at 40-45 DAS	319	21.8	3.7	148	12.3	3795	5678
T ₁₂ : Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) PE followed by Bispyribac Sodium 10% SC 25 g/ha + Penoxsulam 2.67% OD 25 g/ha (Tank mix) PoE followed by mechanical weeding at 40-45 DAS	264	20.4	3.1	126	20.0	3355	4951
T ₁₃ : Mechanical/Hand weeding at 20, 40, 60 DAS	327	22.6	3.7	150	10.0	3959	5876
T ₁₄ : Unweeded control	209	21.0	2.9	110	26.0	1419	2235
S.E.M +	15.2	0.47	0.19	7.58	4.84	164.1	265.1
CD (P=0.05)	44	NS	NS	NS	NS	480	775

Conclusion

Weed management in Dry DSR can be done by adopting mechanical/Hand weeding at 20, 40, 60 DAS under labour available conditions. Under labour scarcity conditions PE application of Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) followed by Metsulfuron Methyl 10% + Chlorimuron ethyl 10% WP 4 g/ha + Cyhalofop Butyl 10% EC 75 g/ha (Tank mix) PoE weed followed by mechanical weeding at 40-45 DAS is the best option. Other suitable Pre emergence herbicides that can be used are Pyrazosulfuron ethyl 10% WP 20 g/ha, Pendimethalin 38.4% + Pyrazosulfuron ethyl 0.85% ZC 900 + 20 g/ha (Ready mix) and Pendimethalin 38.7% CS 677.25 g/ha. Post emergence application of Triafamone 20% + Ethoxysulfuron 10% WG 44 + 22.5 g/ha (Ready mix) and Penoxsulam 1.02% + Cyhalofop-butyl 5.1% OD 135 g/ha (Ready mix) at 2-4 weed leaf stage to manage weed effectively and reap higher grain yield under dry direct seeding.

Reference

- Pradhan A, Dixit A, Keram KS, Dewangan PK. Weed management in dry direct-seeded rice under rainfed ecology of Southern Chhattisgarh. *Indian J Weed Sci.* 2023;55(2):149-152.
- Mahapatra A, Saha S, Munda S, Satapathy BS, Meher S, Jangde HK. Bio-efficacy of herbicide mixtures on weed dynamics in direct wet-seeded rice. *Indian J Weed Sci.* 2023;55(1):18-23.
- Dhanapal GN, Sanjay MT, Nagarjun P, Sandeep A. Integrated weed management for control of complex weed flora in direct-seeded upland rice under Southern transition zone of Karnataka. *Indian J Weed Sci.* 2018;50(1):33-36.
- Ganai MA, Hussain A, Bhat MA. Bio-efficacy of different herbicides in direct-seeded rice (*Oryza sativa*) under temperate Kashmir valley conditions. *Indian J Agron.* 2014;59(1):86-90.
- Malik S, Duary B, Jaiswal DK. Integrated use of herbicide and weed mulch with closer spacing for weed management in dry direct-seeded rice. *Int J Bio-resource Stress Manag.* 2021;12(3):222-227.
- Bhatt PS, Reddy PRR, Varma NRG, Babu TK, Krishna L, Mohan YC, *et al.* Productivity of dry direct-seeded rice as influenced by herbicide combinations. *Int J Environ Climate Change.* 2024;14(3):81-94.
- Parthipan T, Ravi V. Productivity of transplanted rice as influenced by weed control methods. *Afr J Agric Res.* 2014;9(29):2250-2254.
- Pellerin KJ, Webster EP. Imazethapyr at different rates and times in drill and water-seeded imidazolinone-tolerant rice. *Weed Technol.* 2004;18:223-227.
- Pinjari SS, Gangawane SB, Mhaskar NV, Chavan SA, Chavan VG, Jagtap DN. Integrated use of herbicides to enhance yield and economics of direct-seeded rice. *Indian J Weed Sci.* 2016;48(3):279-283.
- Reddy M, Ravishankar BG, Subash G, Joshi VR, Negalur RK. Efficacy of bensulfuron methyl plus pretilachlor for controlling weeds in transplanted rice. *Oryza.* 2012;49(1):65-67.
- Sahu R, Singh G. Integrated weed management in direct-seeded rainfed rice of eastern Uttar Pradesh. *Oryza.* 2011;48(1):76-78.
- Ahmed S, Chauhan BS, Humphreys E. Effect of application timings of soil-applied herbicides on weed growth and crop yield in dry-seeded rice in Bangladesh. In: 24th Asia Pacific Weed Science Congress, October 20-25; c2013, Indonesia.
- Indiastat. Indiastat Report 2022-2023. [Internet]. Available from: www.indiastat.com