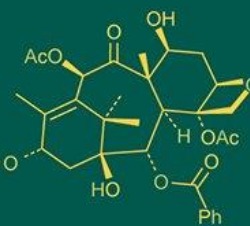
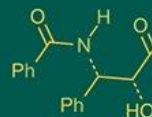


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Effect of different weed management practices on weed density, weed dry matter and weed control efficiency in maize (*Zea mays* L.)

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Abstract

Weed infestation is one of the major constraints limiting maize productivity due to severe competition for nutrients, moisture, light and space during the early stages of crop growth. A field experiment was conducted during the kharif 2025 season at the Instructional-cum-Research Farm, Barrister Thakur Chhedilal College of Agriculture and Research Station, Bilaspur (Chhattisgarh), to evaluate the influence of different weed management practices on weed density, weed dry matter accumulation and weed control efficiency in maize (*Zea mays* L.). The experiment was laid out in a Randomized Block Design with three replications comprising different manual and herbicidal weed management treatments. The experimental field was predominantly infested with mixed weed flora consisting of grasses, broad-leaved weeds and sedges. Weed density and weed dry matter were recorded at 30, 45 and 60 Days After Sowing (DAS) and at harvest, while Weed Control Efficiency (WCE) was computed based on weed dry matter. The results revealed that weed management practices significantly influenced all weed parameters. Hand weeding performed at 30, 45 and 60 DAS recorded the lowest weed density and weed dry matter and the highest weed control efficiency throughout the crop growth period. Among the herbicidal treatments, post-emergence application of Mesotrione 2.27% + Atrazine 22.7% SC @ 80 + 795 g a.i. ha⁻¹ at 30 DAS proved most effective in suppressing the mixed weed flora, resulting in significantly lower weed density and biomass and higher weed control efficiency compared with the remaining herbicidal treatments. The study indicated that this herbicide combination can serve as an efficient and economical alternative to repeated manual weeding for effective weed management in maize under the Chhattisgarh Plains.

Keywords: Maize, weed density, weed dry matter, weed control efficiency, post-emergence herbicide

1. Introduction

Maize (*Zea mays* L.) is one of the world's most important cereal crops owing to its high yield potential, wide adaptability, and multiple uses as food, feed, and industrial raw material. In India, maize is cultivated under diverse agro-climatic conditions and plays a significant role in ensuring food and nutritional security. However, its productivity is often constrained by several biotic and abiotic factors, among which weed infestation is one of the most serious limitations. The slow initial growth and wider row spacing of maize favour rapid weed emergence and establishment, resulting in severe competition for nutrients, moisture, light, and space. Uncontrolled weed growth during the critical period of crop-weed competition (15-45 days after sowing) may cause grain yield losses ranging from 30 to 80%, depending on weed species, density, and environmental conditions. Therefore, timely and effective weed management is essential for reducing crop-weed competition and improving crop productivity.

Maize fields are generally infested with a mixed weed flora consisting of grasses, broad-leaved weeds, and sedges. The composition and intensity of weed infestation vary with agro-climatic conditions, soil type, and crop management practices. Weed density and weed dry matter accumulation are widely used to assess the severity of weed infestation, while Weed Control Efficiency (WCE) is an important indicator of the effectiveness of different weed management practices. These parameters provide valuable information for comparing the bio-efficacy of herbicides and identifying suitable weed management strategies.

Although manual weeding is effective, its adoption has become increasingly difficult because of labour scarcity and rising production costs. Consequently, post-emergence herbicides have emerged as an efficient and economical alternative for controlling complex weed flora in maize. Herbicides such as mesotrione, Mesotrione + Atrazine, topramezone, halosulfuron-methyl, and nicosulfuron have shown promising results against mixed weed populations under different agro-ecological conditions. However, their effectiveness varies depending on weed composition, environmental conditions, and application timing.

Therefore, the present investigation was undertaken to evaluate the influence of different weed management practices on weed density, weed dry matter accumulation, and weed control efficiency in maize under the agro-climatic conditions of Bilaspur, Chhattisgarh Akhtar *et al.* (2017) [1].

2. Materials and Methods

2.1 Experimental site and location

The field investigation was carried out during the kharif 2025 season at the Instructional-cum-Research Farm of Barrister Thakur Chhedilal College of Agriculture and Research Station, Bilaspur, Chhattisgarh, India. The experimental farm is located at 22°09' N latitude and 82°15' E longitude, with an elevation of approximately 264 m above mean sea level. The study area falls under the sub-humid tropical climatic zone, characterized by hot summers and moderate rainfall, with the majority of precipitation occurring during the southwest monsoon period from June to September. The experiment was laid out in a Randomized Block Design (RBD) with three replications comprising seven weed management treatments. Maize (*Zea mays* L.) was sown at the recommended row spacing of 60 cm using recommended agronomic practices. Fertilizer was applied as per the recommended dose, and all intercultural operations, except weed management, were carried out uniformly in all treatments.

2.2 Treatments details

The experiment was laid out in a Randomized Block Design (RBD) with Seven treatments and three replications. Treatments are: T₁: untreated control (weedy check), T₂: hand weeding at 30, 45 and 60 Days After Sowing (DAS), T₃: Topramezone 33.6% SC @ 25.2 g a.i. ha⁻¹ applied as post-emergence at 30 DAS, T₄: Mesotrione 2.27% + Atrazine 22.7% SC @ 80 + 795 g a.i. ha⁻¹ applied as post-emergence at 30 DAS, T₅: Mesotrione 40% SC @ 80 g a.i. ha⁻¹ applied as post-emergence at 30 DAS, T₆: Halosulfuron-methyl 75% WG @ 67.5 g a.i. ha⁻¹ applied as post-emergence at 30 DAS, and T₇: Nicosulfuron 75% WDG @ 45 g a.i. ha⁻¹ applied as post-emergence at 30 DAS.

2.3 Statistical analysis

The data generated from the experiment were statistically analysed using Analysis of Variance (ANOVA) for a Randomized Block Design (RBD) following the procedure outlined by Gomez and Gomez (1984) [11]. The significance of differences among treatments was assessed using the F-test at the 5% level of significance. Whenever the treatment effects were significant, the treatment means were separated using the Critical Difference (CD) test at the 5% probability level.

Table 1: Details of treatment

S. No.	Treatment detail
T ₁	Untreated (weedy check)
T ₂	Hand weeding at 30, 45 & 60 DAS
T ₃	Topramezone 33.6% SC 25.2 g a.i. ha ⁻¹ at 30 DAS
T ₄	Mesotrione 2.27% W/W + Atrazine 22.7% W/W SC 80+795g a.i. ha ⁻¹ DAS
T ₅	Mesotrione 40% SC 80g a.i. ha ⁻¹ at 30 DAS
T ₆	Halosulfuron Methyl 75% WG 67.5g a.i. ha ⁻¹ at 30 DAS
T ₇	Nicosulfuron 75% WDG 45g a.i. ha ⁻¹ at 30 DAS

3. Results and Discussion

3.1 Weed flora

The experimental field was infested with a mixed weed flora including grasses, broad-leaved weeds, and sedges. The predominant grassy weeds were *Echinochloa colona*, *Echinochloa crus-galli*, *Dactyloctenium aegyptium*, *Eleusine indica*, and *Cynodon dactylon*. The major broad-leaved weeds included *Trianthema portulacastrum*, *Digera arvensis*, *Amaranthus spinosus*, *Amaranthus viridis*, and *Commelina benghalensis*, while the sedges were represented by *Cyperus rotundus* and *Cyperus iria*. The occurrence of mixed weed flora indicated the need for effective weed management practices capable of controlling grasses, broad-leaved weeds, and sedges simultaneously. Similar finding reported by Kaul *et al.* (2023) [7].

3.2 Weed density(m⁻²)

3.2.1 Weed density(m⁻²) at 30 DAS

The weed management treatments did not significantly influence the density of grasses, broad-leaved weeds, sedges, or total weeds at 30 DAS. This could be attributed to the application of post-emergence herbicides after observation.

3.2.2 Weed density(m⁻²) at 45 DAS

The weed management practices significantly influenced the density of grasses, broad-leaved weeds, sedges, and total weeds at 45 DAS. The untreated (T₁) recorded the highest weed density owing to the absence of any weed control measure. In contrast, hand weeding (T₂) at 30, 45 and 60 DAS proved to be the most effective treatment in minimizing weed density. Among the herbicidal treatments, post-emergence application of Mesotrione 2.27% + Atrazine 22.7% SC (T₄) was the most effective in suppressing the mixed weed flora, followed by Topramezone 33.6% SC (T₃). Comparatively higher weed density was observed under Mesotrione 40% SC (T₅), Halosulfuron-methyl 75% WG (T₆), and Nicosulfuron 75% WDG(T₇). The effective suppression of grasses, broad-leaved weeds, and sedges by hand weeding (T₂) and the Mesotrione + Atrazine (T₄) combination resulted in lower weed infestation during the critical period of crop growth. These finding are agreement with Sandhya Rani *et al.* (2021) [9].

3.2.3 Weed density(m⁻²) at 60 DAS

The weed management treatments significantly influenced weed density at 60 DAS. The untreated (weedy check) (T₁) maintained the highest weed density throughout the observation period, indicating severe weed infestation in the absence of any weed control measure. Hand weeding at 30, 45 and 60 DAS (T₂) proved to be the most effective treatment in reducing weed density. Among the herbicidal

treatments, Mesotrione 2.27% + Atrazine 22.7% SC @ 80 + 795 g a.i. ha⁻¹ applied at 30 DAS (T₄) recorded the lowest weed density, followed by Topramezone 33.6% SC @ 25.2 g a.i. ha⁻¹ applied at 30 DAS (T₃). The treatments Mesotrione 40% SC @ 80 g a.i. ha⁻¹ (T₅), Halosulfuron-methyl 75% WG @ 67.5 g a.i. ha⁻¹ (T₆), and Nicosulfuron 75% WDG @ 45 g a.i. ha⁻¹ (T₇) were comparatively less effective in suppressing the mixed weed flora. The sustained reduction in weed density under T₂ and T₄ indicated their superior effectiveness in controlling grasses, broad-leaved weeds, and sedges through (m⁻²) out the crop growth period. Similar finding reported by Mastkar *et al.* (2022) [4].

3.2.4 Weed density(m⁻²) at harvest

The trend observed at harvest was similar to that recorded at the earlier stages of crop growth. The untreated (weedy check) (T₁) recorded the highest weed density, indicating continuous weed infestation throughout the crop season in the absence of any weed control measure. In contrast, hand weeding at 30, 45 and 60 DAS (T₂) maintained the lowest weed density. Among the herbicidal treatments, Mesotrione 2.27% + Atrazine 22.7% SC @ 80 + 795 g a.i. ha⁻¹ applied at 30 DAS (T₄) remained the most effective in reducing weed density, followed by Topramezone 33.6% SC @ 25.2 g a.i. ha⁻¹ applied at 30 DAS (T₃). The lower weed density observed under T₂ and T₄ reflected their sustained weed suppressive effect throughout the crop growth period, resulting in reduced crop-weed competition in maize. Similar finding reported by Chaudhari *et al.* (2023) [2].

3.3 Weed dry matter (g m⁻²)

3.3.1 Weed dry matter (g m⁻²) at 30 DAS

Weed management treatments did not significantly affect weed dry matter at 30 DAS. Since the post-emergence herbicides were applied after observation resulting in statistically similar weed dry matter across all treatments.

3.3.2 Weed dry matter (g m⁻²) at 45 DAS

Weed management practices significantly influenced weed dry matter at 45 DAS. The untreated (weedy check) (T₁) recorded the highest weed dry matter, whereas hand weeding at 30, 45 and 60 DAS (T₂) was the most effective treatment. Among the herbicidal treatments, Mesotrione 2.27% + Atrazine 22.7% SC (T₄) recorded the lowest weed dry matter, followed by Topramezone 33.6% SC (T₃). The lower weed dry matter under T₂ and T₄ indicated their effective weed suppressive ability during the crop growth period. Similar finding reported by Roy *et al.* (2023) [8].

3.3.3 Weed dry matter (g m⁻²) at 60 DAS

Weed management practices significantly reduced weed dry matter at 60 DAS. The untreated (weedy check) (T₁) recorded the highest weed dry matter, while hand weeding at 30, 45 and 60 DAS (T₂) was the most effective treatment. Among the herbicides, Mesotrione 2.27% + Atrazine 22.7% SC (T₄) recorded the lowest weed dry matter, followed by Topramezone 33.6% SC (T₃). The lower weed dry matter under T₂ and T₄ indicated their superior weed suppressive effect throughout the crop growth period. Similar finding reported by Mastkar *et al.* (2022) [4].

3.3.4 Weed dry matter (g m⁻²) at harvest

Weed management practices significantly influenced weed dry matter at harvest. The untreated (weedy check) (T₁) recorded the highest weed dry matter, whereas hand weeding at 30, 45 and 60 DAS (T₂) recorded the lowest weed dry matter. Among the herbicidal treatments, Mesotrione 2.27% + Atrazine 22.7% SC (T₄) was the most effective, followed by Topramezone 33.6% SC (T₃). The lower weed dry matter under T₂ and T₄ reflected their sustained weed suppressive effect throughout the crop growth period. Similar finding reported by Kaul *et al.* (2023) [7].

3.4 Weed control efficiency

The weed management treatments markedly influenced Weed Control Efficiency (WCE) during the crop growth period. No weed control efficiency was observed at 30 DAS, as the post-emergence herbicides were applied on the same day of observation. At 45 DAS, 60 DAS, and harvest, the untreated (weedy check) (T₁) recorded the lowest weed control efficiency due to the absence of any weed control measure. Hand weeding at 30, 45 and 60 DAS (T₂) consistently recorded the highest weed control efficiency throughout the observation period. Among the herbicidal treatments, Mesotrione 2.27% + Atrazine 22.7% SC @ 80 + 795 g a.i. ha⁻¹ applied at 30 DAS (T₄) exhibited the highest weed control efficiency, followed by Topramezone 33.6% SC @ 25.2 g a.i. ha⁻¹ (T₃). In contrast, Mesotrione 40% SC (T₅), Halosulfuron-methyl 75% WG (T₆), and Nicosulfuron 75% WDG (T₇) recorded comparatively lower weed control efficiency. The higher weed control efficiency under T₂ and T₄ indicated their superior effectiveness in suppressing mixed weed flora throughout the crop growth period. The results are consistent with Akhtar *et al.* (2017) [1] and Mastkar *et al.* (2022) [4].

Table 2: Effect of post emergence herbicides on weed density m⁻² at 30 DAS in maize (*Zea mays* L.)

S. No.	Treatment details	Weed density m ⁻² at 30 DAS			
		Grasses	BLWs	Sedges	Total
T ₁	Untreated (Weedy check)	7.94 (62.67)	6.91 (47.33)	5.49 (29.67)	11.84 (139.67)
T ₂	Hand weeding at 30,45 & 60 DAS	8.06 (64.67)	6.72 (44.67)	5.32 (28.00)	11.73 (137.33)
T ₃	Topramezone 33.6% SC 25.2 g a.i. ha ⁻¹ at 30 DAS	8.21 (67.00)	6.88 (47.00)	5.33 (28.00)	11.94 (142.00)
T ₄	Mesotrione 2.27% w/w + Atrazine 22.7% w/w SC 80+795g a.i. ha ⁻¹ at 30 DAS	8.02 (64.00)	6.96 (48.00)	5.49 (29.67)	11.92 (141.67)
T ₅	Mesotrione 40% SC 80 g a.i. ha ⁻¹ at 30 DAS	8.06 (64.67)	6.79 (45.67)	5.37 (28.33)	11.79 (138.67)
T ₆	Halosulfuron Methyl 75% WG 67.5g a.i.ha ⁻¹ at 30 DAS	8.05 (64.33)	6.59 (43.00)	5.46 (29.33)	11.71 (136.67)
T ₇	Nicosulfuron 75% WDG 45g a.i. ha ⁻¹ at 30 DAS	8.00 (63.67)	6.92 (47.67)	5.61 (31.00)	11.95 (142.33)
	SEm (±)	0.27	0.23	0.18	0.22
	CD (5%)	NS	NS	NS	NS

*Values in parentheses are original observations, while values outside the parentheses are square root transformed values [$\sqrt{X + 0.5}$] used for statistical analysis

Table 3: Effect of post emergence herbicides on weed density m⁻² at 45 DAS in maize (*Zea mays* L.)

S. No.	Treatment details	Weed density m ⁻² at 45 DAS			
		Grasses	BLWs	Sedges	Total
T ₁	Untreated (Weedy check)	10.74 (115.00)	8.80 (77.00)	6.28 (39.00)	15.21 (231.00)
T ₂	Hand weeding at 30,45 & 60 DAS	3.78 (14.00)	3.53 (12.00)	3.29 (10.33)	6.06 (36.33)
T ₃	Topramezone 33.6% SC 25.2 g a.i. ha ⁻¹ at 30 DAS	5.17 (26.33)	4.44 (19.33)	3.80 (14.00)	7.75 (59.67)
T ₄	Mesotrione 2.27% w/w + Atrazine 22.7% w/w SC 80+795g a.i. ha ⁻¹ at 30 DAS	4.26 (17.67)	3.60 (12.67)	3.71 (13.33)	6.64 (43.67)
T ₅	Mesotrione 40% SC 80 g a.i. ha ⁻¹ at 30 DAS	5.95 (35.00)	5.43 (29.33)	3.97 (15.33)	8.94 (79.67)
T ₆	Halosulfuran Methyl 75% WG 67.5g a.i.ha ⁻¹ at 30 DAS	6.65 (44.00)	5.80 (33.33)	3.24 (10.00)	9.36 (87.33)
T ₇	Nicosulfuran 75% WDG 45g a.i. ha ⁻¹ at 30 DAS	5.46 (29.33)	5.55 (30.33)	3.94 (15.00)	8.67 (74.67)
	SEm (±)	0.22	0.20	0.15	0.23
	CD (5%)	0.60	0.62	0.47	0.72

*Values in parentheses are original observations, while values outside the parentheses are square root transformed values [$\sqrt{(X + 0.5)}$] used for statistical analysis

Table 4: Effect of post emergence herbicides on weed density m⁻² at 60 DAS in maize (*Zea mays* L.)

S. No.	Treatment details	Weed density m ⁻² at 60 DAS			
		Grasses	BLWs	Sedges	Total
T ₁	Untreated (Weedy check)	11.42 (130.00)	9.75 (94.67)	6.74 (45.00)	16.43 (269.67)
T ₂	Hand weeding at 30,45 & 60 DAS	3.93 (15.00)	4.05 (16.00)	3.34 (10.67)	6.48 (42.33)
T ₃	Topramezone 33.6% SC 25.2 g a.i. ha ⁻¹ at 30 DAS	5.44 (29.33)	5.33 (28.00)	4.21 (17.33)	8.66 (73.33)
T ₄	Mesotrione 2.27% w/w + Atrazine 22.7% w/w SC 80+795g a.i. ha ⁻¹ at 30 DAS	4.06 (16.00)	4.16 (17.00)	3.80 (14.00)	6.88 (48.00)
T ₅	Mesotrione 40% SC 80 g a.i. ha ⁻¹ at 30 DAS	6.56 (42.67)	5.26 (27.33)	4.26 (17.67)	9.39 (87.67)
T ₆	Halosulfuran Methyl 75% WG 67.5g a.i.ha ⁻¹ at 30 DAS	6.86 (46.67)	7.08 (49.67)	3.39 (11.00)	10.38 (107.67)
T ₇	Nicosulfuran 75% WDG 45g a.i. ha ⁻¹ at 30 DAS	5.90 (34.33)	5.20 (26.67)	4.26 (17.67)	8.89 (78.67)
	SEm (±)	0.23	0.23	0.16	0.23
	CD (5%)	0.69	0.71	0.5	0.71

*Values in parentheses are original observations, while values outside the parentheses are square root transformed values [$\sqrt{(X + 0.5)}$] used for statistical analysis

Table 5: Effect of post emergence herbicides on weed density m⁻² at harvest in maize (*Zea mays* L.)

S. No.	Treatment details	Weed density m ⁻² at Harvest			
		Grasses	BLWs	Sedges	Total
T ₁	Untreated (Weedy check)	11.29 (127.00)	9.65 (92.67)	6.67 (44.00)	16.25 (263.67)
T ₂	Hand weeding at 30,45 & 60 DAS	3.94 (15.00)	4.29 (18.00)	3.34 (10.67)	6.64 (43.67)
T ₃	Topramezone 33.6% SC 25.2 g a.i. ha ⁻¹ at 30 DAS	5.45 (29.33)	5.30 (27.67)	4.18 (17.00)	8.63 (74.00)
T ₄	Mesotrione 2.27% w/w + Atrazine 22.7% w/w SC 80+795g a.i. ha ⁻¹ at 30 DAS	4.25 (17.67)	4.22 (17.33)	3.67 (13.00)	6.96 (48.00)
T ₅	Mesotrione 40% SC 80 g a.i. ha ⁻¹ at 30 DAS	6.54 (42.33)	5.20 (26.67)	4.26 (17.67)	9.33 (86.67)
T ₆	Halosulfuran Methyl 75% WG 67.5g a.i.ha ⁻¹ at 30 DAS	6.79 (45.67)	7.03 (49.00)	3.29 (10.33)	10.27 (105.00)
T ₇	Nicosulfuran 75% WDG 45g a.i. ha ⁻¹ at 30 DAS	5.84 (33.67)	5.13 (26.00)	4.22 (17.33)	8.80 (77.00)
	SEm (±)	0.22	0.21	0.14	0.20
	CD (5%)	0.69	0.65	0.43	0.60

*Values in parentheses are original observations, while values outside the parentheses are square root transformed values [$\sqrt{(X + 0.5)}$] used for statistical analysis

Table 6: Effect of post emergence herbicides on weed dry matter g m⁻² at 30 DAS in maize (*Zea mays* L.)

S. No.	Treatment details	Weed dry matter at 30 DAS g m ⁻²			
		Grasses	BLWs	Sedges	Total
T ₁	Untreated (Weedy check)	5.35 (28.20)	4.91 (23.67)	3.06 (8.90)	7.83 (60.77)
T ₂	Hand weeding at 30,45 & 60 DAS	5.43 (29.10)	4.78 (22.33)	2.98 (8.40)	7.76 (59.83)
T ₃	Topramezone 33.6% SC 25.2 g a.i. ha ⁻¹ at 30 DAS	5.53 (30.15)	4.89 (23.50)	2.98 (8.40)	7.91 (62.05)
T ₄	Mesotrione 2.27% w/w + Atrazine 22.7% w/w SC 80+795g a.i. ha ⁻¹ at 30 DAS	5.40 (28.80)	4.95 (24.00)	3.06 (8.90)	7.88 (61.70)
T ₅	Mesotrione 40% SC 80 g a.i. ha ⁻¹ at 30 DAS	5.44 (29.10)	4.83 (22.83)	3.00 (8.50)	7.80 (60.43)
T ₆	Halosulfuran Methyl 75% WG 67.5g a.i.ha ⁻¹ at 30 DAS	5.42 (28.95)	4.69 (21.50)	3.05 (8.80)	7.73 (59.25)
T ₇	Nicosulfuran 75% WDG 45g a.i. ha ⁻¹ at 30 DAS	5.39 (28.65)	4.92 (23.83)	3.13 (9.30)	7.89 (61.78)
	SEm (±)	0.18	0.16	0.10	0.14
	CD (5%)	NS	NS	NS	NS

*Values in parentheses are original observations, while values outside the parentheses are square root transformed values [$\sqrt{(X + 0.5)}$] used for statistical analysis

Table 7: Effect of post emergence herbicides on weed dry matter g m⁻² at 45 DAS in maize (*Zea mays* L.)

S. No.	Treatment details	Weed dry matter g m ⁻² at 45 DAS			
		Grasses	BLWs	Sedges	Total
T ₁	Untreated (Weedy check)	8.24 (67.48)	7.05 (49.18)	4.23 (17.42)	11.60 (134.08)
T ₂	Hand weeding at 30,45 & 60 DAS	3.08 (9.04)	2.93 (8.13)	2.26 (4.60)	4.68 (21.43)
T ₃	Topramezone 33.6% SC 25.2 g a.i. ha ⁻¹ at 30 DAS	4.55 (20.27)	3.44 (11.32)	2.65 (6.56)	6.21 (38.15)
T ₄	Mesotrione 2.27% w/w + Atrazine 22.7% w/w SC 80+795g a.i. ha ⁻¹ at 30 DAS	3.41 (11.18)	2.97 (8.36)	2.46 (5.53)	5.06 (25.07)
T ₅	Mesotrione 40% SC 80 g a.i. ha ⁻¹ at 30 DAS	5.13 (25.87)	4.43 (19.20)	2.72 (6.90)	7.24 (51.97)
T ₆	Halosulfuran Methyl 75% WG 67.5g a.i.ha ⁻¹ at 30 DAS	5.42 (28.95)	4.65 (21.22)	2.06 (3.73)	7.37 (53.91)
T ₇	Nicosulfuran 75% WDG 45g a.i. ha ⁻¹ at 30 DAS	4.89 (23.47)	4.23 (17.47)	2.68 (6.70)	6.93 (47.63)
	SEm (±)	0.16	0.15	0.10	0.22
	CD (5%)	0.50	0.47	0.29	0.66

Values in parentheses are original observations, while values outside the parentheses are square root transformed values [$\sqrt{(X + 0.5)}$] used for statistical analysis

Table 8: Effect of post emergence herbicides on weed dry matter g m⁻² at 60 DAS in maize (*Zea mays* L.)

S. No.	Treatment details	Weed dry matter g m ⁻² at 60 DAS			
		Grasses	BLWs	Sedges	Total
T ₁	Untreated (Weedy check)	9.82 (96.05)	8.92 (79.02)	4.97 (24.18)	14.13 (199.25)
T ₂	Hand weeding at 30,45 & 60 DAS	3.14 (9.39)	3.83 (14.22)	2.32 (4.92)	5.39 (28.52)
T ₃	Topramezone 33.6% SC 25.2 g a.i. ha ⁻¹ at 30 DAS	5.10 (25.50)	5.13 (25.94)	3.16 (9.53)	7.83 (60.97)
T ₄	Mesotrione 2.27% w/w + Atrazine 22.7% w/w SC 80+795g a.i. ha ⁻¹ at 30 DAS	3.54 (12.13)	4.03 (15.81)	2.59 (6.24)	5.88 (34.18)
T ₅	Mesotrione 40% SC 80 g a.i. ha ⁻¹ at 30 DAS	5.84 (33.63)	5.33 (28.01)	3.26 (10.16)	8.50 (71.80)
T ₆	Halosulfuran Methyl 75% WG 67.5g a.i.ha ⁻¹ at 30 DAS	6.12 (37.02)	6.00 (35.58)	2.38 (5.16)	8.84 (77.76)
T ₇	Nicosulfuran 75% WDG 45g a.i. ha ⁻¹ at 30 DAS	5.51 (29.85)	5.22 (26.73)	3.20 (9.76)	8.17 (66.34)
	SEm (±)	0.16	0.16	0.10	0.21
	CD (5%)	0.49	0.49	0.31	0.64

*Values in parentheses are original observations, while values outside the parentheses are square root transformed values [$\sqrt{(X + 0.5)}$] used for statistical analysis

Table 9: Effect of post emergence herbicides on weed dry matter g m⁻² at harvest in maize (*Zea mays* L.)

S. No.	Treatment details	Weed dry matter g m ⁻² at harvest			
		Grasses	BLWs	Sedges	Total
T ₁	Untreated (Weedy check)	9.84 (96.32)	8.96 (79.76)	5.09 (25.45)	14.21 (201.53)
T ₂	Hand weeding at 30,45 & 60 DAS	3.17 (9.55)	3.93 (14.99)	2.41 (5.33)	5.51 (29.87)
T ₃	Topramezone 33.6% SC 25.2 g a.i. ha ⁻¹ at 30 DAS	5.20 (26.56)	5.13 (25.85)	3.27 (10.20)	7.94 (62.61)
T ₄	Mesotrione 2.27% w/w + Atrazine 22.7% w/w SC 80+795g a.i. ha ⁻¹ at 30 DAS	3.56 (12.18)	4.10 (16.30)	2.66 (6.59)	5.96 (35.07)
T ₅	Mesotrione 40% SC 80 g a.i. ha ⁻¹ at 30 DAS	5.82 (33.41)	5.45 (29.26)	3.34 (10.67)	8.59 (73.34)
T ₆	Halosulfuran Methyl 75% WG 67.5g a.i.ha ⁻¹ at 30 DAS	5.85 (33.76)	6.47 (41.40)	2.39 (5.20)	8.99 (80.36)
T ₇	Nicosulfuran 75% WDG 45g a.i. ha ⁻¹ at 30 DAS	5.33 (27.91)	5.31 (27.72)	3.30 (10.40)	8.15 (66.03)
	SEm (±)	0.13	0.15	0.09	0.16
	CD (5%)	0.41	0.45	0.27	0.51

*Values in parentheses are original observations, while values outside the parentheses are square root transformed values [$\sqrt{(X + 0.5)}$] used for statistical analysis

Table 10: Effect of post emergence herbicides on weed control efficiency (%) in maize (*Zea mays* L.)

S. No.	Treatment details	Weed control efficiency (%)			
		30 DAS	45 DAS	60 DAS	At harvest
T ₁	Untreated (Weedy check)	0.00	0.00	0.00	0.00
T ₂	Hand weeding at 30,45 & 60 DAS	0.00	84.05	85.69	85.18
T ₃	Topramezone 33.6% SC 25.2 g a.i. ha ⁻¹ at 30 DAS	0.00	71.49	69.32	68.86
T ₄	Mesotrione 2.27% w/w + Atrazine 22.7% w/w SC 80+795g a.i. ha ⁻¹ at 30 DAS	0.00	81.28	82.78	82.59
T ₅	Mesotrione 40% SC 80 g a.i. ha ⁻¹ at 30 DAS	0.00	61.06	64.01	63.63
T ₆	Halosulfuran Methyl 75% WG 67.5g a.i.ha ⁻¹ at 30 DAS	0.00	59.55	61.01	60.02
T ₇	Nicosulfuran 75% WDG 45g a.i. ha ⁻¹ at 30 DAS	0.00	64.30	66.64	67.28

4. Conclusion

The study demonstrated that weed management practices significantly influenced weed density, weed dry matter, and weed control efficiency in maize. Among all the treatments,

hand weeding at 30, 45 and 60 DAS (T₂) proved to be the most effective in suppressing weed growth throughout the crop growth period. Among the post-emergence herbicides, Mesotrione 2.27% + Atrazine 22.7% SC @ 80 + 795 g a.i.

ha⁻¹ applied at 30 DAS consistently recorded lower weed density and weed dry matter along with higher weed control efficiency, followed by Topramezone 33.6% SC @ 25.2 g a.i. ha⁻¹ (T₃). Therefore, the application of Mesotrione 2.27% + Atrazine 22.7% SC @ 80 + 795 g a.i. ha⁻¹ at 30 DAS can be considered an effective post-emergence weed management option for controlling mixed weed flora in maize under the agro-climatic conditions of Chhattisgarh.

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