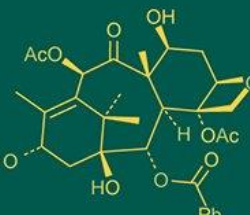
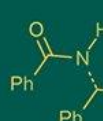


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Effect of integrated weed management on wheat (*Triticum aestivum* L.) under irrigated condition

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Abstract

The present investigation entitled “Effect of integrated weed management on wheat (*Triticum aestivum* L.) under irrigated condition” a field experiment was conducted during the *Rabi* 2022-23 at the Instructional-cum-Research Farm, BTC CARS Bilaspur (Chhattisgarh), using random block design with eleven treatments and three replications during *Rabi* season 2022-23. All the growth and yield attributing characters of wheat crop i.e., plant height, number of total tillers m⁻², dry matter accumulation g day⁻¹ plant⁻¹, ear length (cm), number of grain ear⁻¹, test weight, grain yield and straw yield were recorded higher under treatment (T11) Weed free. Among all the integrated weed management treatments the significantly higher all growth and yield attributing characters were recorded under treatment (T3) Hand weeding at 20 DAS & 40 DAS, which was statically at par with treatment (T5) Pendimethalin 30% EC @ 1.0 kg a.i. ha⁻¹ as pre-emergence + hand weeding at 20 DAS. Significantly lowest growth attributes and yield were recorded under treatment (T1) Control.

Keywords: Pendimethalin, Metsulfuron, integrated weed management, wheat, yield

Introduction

At global level wheat (*Triticum aestivum* L.) is the most important and integral component of food security. Wheat grown throughout the world and known as “King of Cereals”. In India wheat is the main staple food. In India mainly three species of wheat are cultivated: Common bread wheat (*Triticum aestivum* L.), Macaroni or durum wheat (*Triticum durum* L.) and Emmer wheat (*Triticum dicoccum* L.), covering 86%, 12% and 2 % of total wheat area respectively, out of these the maximum area is covered by *Triticum aestivum* L. species. Wheat content 12% protein relatively high compared to other major cereals. In India all of the agricultural losses weeds account for 33%, disease 26%, insects 20% and other 21%, It show that weed cause maximum damage for wheat crops. In India, there are 30.47 million hectares total under cultivation, producing 106.8 million tons of wheat year with an average productivity of 3507 kg ha⁻¹ (Economic survey of India 2022-23). Influence of weeds losses depends on their type, abundance, and environmental factor (Chhokar *et al.* 2012) [4]. Because of this much of losses produce by weeds we need to effective weed management for ensuring food for increasing population. For ecological approach to weed management Integrated Weed Management (IWM) is reduce dependence on herbicide through understanding the weed ecology, weed biology and use varies weed management tools including agronomic, mechanical, chemical & biological methods.

Materials and Methods

The experiment was conducted in the *Rabi* season of 2022–2023 at the BTC College of Agriculture and Research Station in Bilaspur, Chhattisgarh. The Research Farm is located at 22° 09' N latitude and 82° 15' E longitude, at an elevation of 298 m above mean sea level. The area is part of India's Eastern Plateau and Hill Region (Ago-climatic Zone-7). The state of Chhattisgarh is divided into three agro-climatic zones, and Bilaspur is located inside the Chhattisgarh Plains zone. The CG 1023 wheat variety was planted on November 17, 2022, and harvested on March 08, 2023.

The experiment included 11 different treatments, i.e. included (T₁) Control, (T₂) Hand weeding at 20 DAS, (T₃) Hand weeding at 20 DAS & 40 DAS, (T₄) Pendimethalin 30% EC

@ 1.0 kg a.i. ha⁻¹ as pre emergence, (T₅) Pendimethalin 30% EC @ 1.0 kg a.i. ha⁻¹ as pre emergence + hand weeding at 20 DAS, (T₆) Metsulfuron 20% WP @ 4.0 g a.i. ha⁻¹ as post emergence at 20 DAS, (T₇) Pendimethalin 30% EC @ 1.0 kg a.i. ha⁻¹ as pre emergence + Metsulfuron 20% WP @ 4.0 g a.i. ha⁻¹ as post emergence at 20 DAS, (T₈) Mechanical weeding at 20 DAS, (T₉) Mechanical weeding at 20 DAS & 40 DAS, (T₁₀) Pendimethalin 30% EC @ 1.0 kg a.i. ha⁻¹ as pre emergence + mechanical weeding at 20 DAS and (T₁₁) Weed free, using random block design with 3 replication.

Results and Discussion

The significant results of the present inquiry are summarized as follows:

Plant height

The treatment (T₁₁) weed free reported the highest possible plant height at 30, 60, 90 DAS and at harvest, measuring (32.62 cm, 70.91 cm, 89.11 cm) and (87.21 cm), respectively, which was closely followed by treatment (T₅) pendimethalin 30% EC @ 1.0 kg a.i. ha⁻¹ as pre emergence + hand weeding at 20 DAS (31.66) at 30 DAS and treatment (T₃) hand weeding at 20 DAS & 40 DAS (67.91, 85.98 and 84.18 cm) at 60, 90 DAS and at harvest. The lowest plant height during all growth stages was considerably recorded by control (T₁).

Number of total tillers (m⁻²)

The treatment (T₁₁) weed free showed the highest number of tillers m⁻² (197.25, 443.84, 437.00) and 418.56) at the 30, 60, 90 DAS and at harvest, followed by treatment (T₅) pendimethalin 30% EC @ 1.0 kg a.i. ha⁻¹ as pre-emergence + hand weeding at 20 DAS (193.41) at 30 DAS and treatment (T₃) hand weeding at 20 DAS & 40 DAS (298.56, 374.93 and 345.66 tillers m⁻²) at 60, 90 DAS and at harvest. The statistically lowest number of tillers m⁻² was found in the treatment (T₁) control (140.85, 202.39, 221.32 and 199.89 m⁻²) at all the growth stages. Similar results have also been observed by Sharma (2009) [2].

Dry matter accumulation (g plant⁻¹)

The highest dry matter of the wheat plant at 30, 60, 90 DAS and at harvest was recorded in treatment (T₁₁) Weed free (0.69, 8.09, 17.79 and 24.10 g plant⁻¹), followed by treatment (T₅) Pendimethalin 30% EC @ 1.0 kg a.i. ha⁻¹ as pre-emergence + hand weeding at 20 DAS, at 30 DAS and treatment (T₃) Hand weeding at 20 DAS & 40 DAS, at 60, 90 DAS and at harvest (7.52, 15.98, 22.12 g plant⁻¹). Treatment (T₁) Control had lowest dry matter accumulation (0.54, 4.03, 6.07 and 7.32 g plant⁻¹) at all the growth stages. These findings matched the findings reported by Singh *et al.* (2011) [3].

Table 1: Effect of different treatments on plant height (cm) of wheat

	Treatment	Plant height (cm)			
		30 DAS	60 DAS	90 DAS	At harvest
T ₁	Control	23.16	40.27	62.32	60.82
T ₂	Hand weeding at 20 DAS	29.92	55.12	76.47	74.68
T ₃	Hand weeding at 20 DAS & 40 DAS	29.92	63.91	85.98	84.18
T ₄	Pendimethalin 30% EC @ 1.0 kg a.i. ha ⁻¹ as pre-emergence	31.17	54.44	75.82	74.12
T ₅	Pendimethalin 30% EC @ 1.0 kg a.i. ha ⁻¹ as pre-emergence + hand weeding at 20 DAS	31.22	66.78	85.03	83.33
T ₆	Metsulfuron 20% WP @ 4.0 g a.i. ha ⁻¹ as post emergence at 20 DAS	30.25	52.92	73.10	71.19
T ₇	Pendimethalin 30% EC @ 1.0 kg a.i. ha as pre-emergence + metsulfuron 20% WP @ 4.0 G a.i. ha ⁻¹ as post emergence at 20 DAS	31.66	65.98	84.93	83.11
T ₈	Mechanical weeding at 20 DAS	29.78	53.39	73.93	72.12
T ₉	Mechanical weeding at 20 DAS & 40 DAS	29.88	63.99	83.50	81.61
T ₁₀	Pendimethalin 30% EC @ 1.0 kg a.i. ha ⁻¹ as pre-emergence + mechanical weeding at 20 DAS	31.10	65.03	83.96	82.06
T ₁₁	Weed free	32.62	70.91	89.11	87.21
SEm ±		1.15	2.59	2.25	2.33
CD (P=0.05)		3.41	7.66	6.62	6.88

Table 2: Effect of different treatments on number of tillers (m⁻²) of wheat

	Treatment	Number of tillers (m ⁻²)			
		30 DAS	60 DAS	90 DAS	At Harvest
T ₁	Control	140.85	202.39	221.32	199.89
T ₂	Hand weeding at 20 DAS	170.24	251.19	311.97	283.90
T ₃	Hand weeding at 20 DAS & 40 DAS	189.29	290.56	365.93	345.66
T ₄	Pendimethalin 30% EC @ 1.0 kg a.i. ha ⁻¹ as pre emergence	175.46	245.36	301.45	264.55
T ₅	Pendimethalin 30% EC @ 1.0 kg a.i. ha ⁻¹ as pre emergence + hand weeding at 20 DAS	191.32	286.13	360.46	338.21
T ₆	Metsulfuron 20% WP @ 4.0 g a.i. ha ⁻¹ as post emergence at 20 DAS	165.35	241.78	292.32	273.94
T ₇	Pendimethalin 30% EC @ 1.0 kg a.i. ha as pre emergence + metsulfuron 20% WP @ 4.0 G a.i. ha ⁻¹ as post emergence at 20 DAS	193.41	193.41	357.82	335.72
T ₈	Mechanical weeding at 20 DAS	167.24	237.25	282.71	255.15
T ₉	Mechanical weeding at 20 DAS & 40 DAS	188.79	268.68	333.63	319.52
T ₁₀	Pendimethalin 30% EC @ 1.0 kg a.i. ha ⁻¹ as pre emergence + mechanical weeding at 20 DAS	190.51	275.73	343.58	326.47
T ₁₁	Weed free	198.91	305.93	382.59	352.37
SEm ±		5.71	5.17	5.49	4.97
CD (P=0.05)		16.85	15.24	16.20	16.93

Table 3: Effect of different treatments on dry matter accumulation (g plant⁻¹) of wheat

	Treatment	Dry matter accumulation (g plant ⁻¹)			
		30 DAS	60 DAS	90 DAS	At Harvest
T ₁	Control	0.54	4.03	6.07	7.32
T ₂	Hand weeding at 20 DAS	0.60	5.99	11.08	15.53
T ₃	Hand weeding at 20 DAS & 40 DAS	0.65	7.52	15.98	22.12
T ₄	Pendimethalin 30% EC @ 1.0 kg a.i. ha ⁻¹ as pre-emergence	0.62	5.66	10.59	14.92
T ₅	Pendimethalin 30% EC @ 1.0 kg a.i. ha ⁻¹ as pre-emergence + hand weeding at 20 DAS	0.67	7.35	15.24	21.23
T ₆	Metsulfuron 20% WP @ 4.0 g a.i. ha ⁻¹ as post emergence at 20 DAS	0.59	5.71	10.22	14.52
T ₇	Pendimethalin 30% EC @ 1.0 kg a.i. ha as pre-emergence + metsulfuron 20% WP @ 4.0 G a.i. ha ⁻¹ as post emergence at 20 DAS	0.63	7.11	14.68	20.12
T ₈	Mechanical weeding at 20 DAS	0.58	5.82	10.01	13.89
T ₉	Mechanical weeding at 20 DAS & 40 DAS	0.65	6.22	13.48	18.51
T ₁₀	Pendimethalin 30% EC @ 1.0 kg a.i. ha ⁻¹ as pre-emergence + mechanical weeding at 20 DAS	0.67	6.79	13.89	19.04
T ₁₁	Weed free	0.69	8.09	17.79	24.10
SEm ±		0.02	0.46	0.80	0.72
CD (P=0.05)		0.09	1.35	2.36	2.13

Ear length

The treatment (T₁₁) weed free had the longest ear length (9.68 cm), followed by treatment (T₃) hand weeding at 20 DAS & 40 DAS (9.43), while in treatment (T₁) control recorded the shortest ear length (5.44 cm).

Number of grains ear⁻¹

The treatment (T₁₁) weed free had the highest number of grains ear⁻¹ head (30.94), whereas treatment (T₃) hand weeding at 20 DAS & 40 DAS and treatment (T₅) Pendimethalin 30% EC @1.0 kg a.i. ha⁻¹ as pre-emergence + hand weeding at 20 DAS gave statistically comparable results (29.03) and (28.58), respectively. The treatment (T₁) Control, which was statistically inferior to other treatments, recorded the lowest number of grains ear⁻¹. These findings corroborate those of Dhiman *et al.* (2000) [5].

Test weight (g)

The treatment (T₁₁) weed free had the highest test weight (43.75), followed by the treatment (T₃) hand weeding at 20 DAS & 40 DAS (42.56), and treatment (T₅) pendimethalin 30% EC @ 1.0 kg a.i. ha⁻¹ as pre emergence + hand weeding at 20 DAS (42.30). The treatment (T₁) control, resulted in a

significantly lower test weight (32.58 g). Comparable findings reported by Punia *et al.* (2011) [3].

Grain yield (q ha⁻¹)

Significantly higher grain yield (40.04 q ha⁻¹) was recorded in treatment (T₁₁) weed free. However, the difference among the i.e. treatment (T₃) Hand weeding at 20 DAS and 40 DAS, treatment (T₅) pendimethalin 30% EC @1.0kg a.i. ha⁻¹ as pre-emergence + metsulfuron 20% WP @ 4.0g a.i. ha⁻¹ as post emergence at 20 DAS were at par with the treatment T₁₁, T₃ and T₅ i.e. 35.07, 36.03 and 37.27 q ha⁻¹ respectively, over other treatment combinations. Minimum grain yield was recorded in treatment (T₁) control (12.98 q ha⁻¹).

Straw yield (q ha⁻¹)

The treatment (T₁₁) weed free had the highest straw yield (42.12 q ha⁻¹) than any other treatment, followed by treatment (T₃) hand weeding at 20 DAS & 40 DAS (39.33 q ha⁻¹) and treatment (T₅) pendimethalin 30% EC @ 1.0 kg a.i. ha⁻¹ as a pre-emergence + hand weeding at 20 DAS (38.28). Treatment (T₁) control, yielded significantly less straw than other treatments (17.19 q ha⁻¹).

Table 4: Effect of different treatments on grain yield (qha⁻¹), straw yield (q ha⁻¹) and harvest index (%) of wheat

	Ear length (cm)	Grains ear ⁻¹ head	Test weight (g)	Grain yield (q ha ⁻¹)	Straw yield (q ha ⁻¹)
T ₁	5.44	15.30	32.58	12.98	17.19
T ₂	8.29	23.55	39.08	28.78	31.82
T ₃	9.43	29.03	42.56	37.27	39.33
T ₄	8.06	23.10	38.56	27.94	31.14
T ₅	9.31	28.58	42.30	36.03	38.28
T ₆	8.18	23.31	38.85	28.05	32.06
T ₇	9.18	27.91	42.04	35.07	37.50
T ₈	7.64	22.92	38.78	26.77	29.94
T ₉	9.02	25.96	41.59	33.10	35.52
T ₁₀	9.11	25.99	41.80	34.78	36.98
T ₁₁	9.68	30.94	43.75	40.04	42.12
SEm ±	0.26	0.25	0.77	1.75	1.62
CD (P=0.05)	0.79	0.75	2.28	5.18	4.80

Conclusion

The treatment (T₁₁) Weed free is most effective weed control method for wheat crop which give better growth and yield attributes, give significantly higher grain yield (40.04

q ha⁻¹). Whereas, treatment (T₃) comparable to treatment (T₁₁) in all characters, which give higher grain yield (37.27 q ha⁻¹).

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