

International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
IJABR 2026; SP-10(5): 802-804
www.biochemjournal.com
Received: 13-02-2026
Accepted: 16-03-2026

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Effect of tillage and weed management practices on performance of wheat (*Triticum aestivum* L.)

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DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i5Sj.8476>

Abstract

A field experiment entitled Effect of tillage and weed management practices on performance of wheat (*Triticum aestivum* L.) conducted during Rabi 2025-26 at Agriculture farm, Suresh Gyan Vihar University, Jaipur on sandy loam soil. Stale seed bed using shallow tillage significantly increased yield attributes (effective tiller, spike length, seed spike⁻¹), seed, straw and biological yields over conventional tillage. Metsulfuron at 4.0 g ha⁻¹ + one hand hoeing improved the effective tiller, number of grains per spike, spike length, seed and straw yield of wheat over weedy check and 2,4-D @ 500 g/ha over 2, 4-D @ 500 g/ha except weed free. The maximum net return and B: C ratio was recorded with state seed bed technique with shallow tillage (Rs 61212 ha⁻¹ and 1.33) followed by conventional tillage (Rs 54910 ha⁻¹ and 1.28). The highest net return (Rs 71426 ha⁻¹ and 1.56) was recorded with metsulfuron 4.0 g/ha at 30 DAS + one hand weeding at 45 DAS which were significantly higher to control and remained statistically at par with weed free and metsulfuron 4.0 g/ha at 30 DAS.

Keywords: Nitrogen, grain, spike, weeds and yield

Introduction

India is self-sufficient in catering to the needs of major food staples like rice and wheat. On an average, wheat contributes to around 35% of total food grain production and 21% of cultivated area in the country (Kumar *et al.*, 2016) [6]. In India, wheat (*Triticum aestivum* L.) is the second most important cereal crop after rice and pre-dominant winter season crop of north-western plains zone. Wheat is grown on 32.80 million hectares (m ha) lands with total production of 117.94 million tons (m t) contributes 34 percent of the total food grain production in the country with the productivity of 3595 kg ha⁻¹ (Ministry of Agriculture, GOI 2025-26) [3]. Wheat Productivity has to be raised to meet ever increasing food demand in the country. In Rajasthan area under wheat crop is 3.17 m ha with production of 11.27 m t and productivity of 3559 kg ha⁻¹ (Ministry of Agriculture, GOR, 2025-26) [3].

Weeds are unwanted plants and compete with crops for water, soil, nutrients, light, and space and thus reduce crop yields (Das, 2008) [1]. Verma *et al.* (2008) reported infestation of weed throughout crop growth period caused 43.63 percent reduction in grain yield of wheat. The chemical control of weeds in general has been realised to be more cost effective and easy compared to manual weeding (Shivran *et al.* (2020) [10]. Herbicides play an important role for weed control in close spaced crops like wheat and barley, where manual or mechanical weeding is difficult.

Methods and Materials

A field experiment entitled Effect of tillage and weed management practices on performance of wheat (*Triticum aestivum* L.) conducted during Rabi 2025-26 at Agriculture farm, Suresh Gyan Vihar University, Jaipur on sandy loam soil. Geographically, the study area is located at 75°48'84" E longitude and 26°82'47" N latitude and this region falls under agro-climatic zone III A (Semi-arid Eastern Plain Zone) of Rajasthan. The treatments in wheat during rabi seasons comprising 10 combinations having 2 tillage practices stale seed bed using shallow tillage and conventional tillage and 5 weed management treatments was laid out in a split plot design with three replications (Weedy check, weed free, 2,4-D @ 0.5 kg ha⁻¹ and metsulphuron methyl @ 4 g ha⁻¹ and metsulphuron methyl @ 4 g ha⁻¹ + one hand weeding 45 DAS).

Results and Discussion

Effect of tillage

Results revealed that number of effective tillers per meter row length and number of grains per spike were recorded significantly higher in seed bed with shallow tillage as compared to conventional tillage. Higher effective tillers and other yield attributing characters in SSB using shallow tillage may due to better weed control. Consequently, higher growth which leads to higher yield attributing characters of wheat in these treatments compared to conventional tillage treatments (Kumar *et al.* (2016) [6]. Results revealed that seed, straw and biological yield were recorded significantly higher in seed bed with shallow tillage as compared to conventional tillage. The percent increased the seed yield with stage seed bed with shallow tillage in tune of 9.53 percent. The percent increased the straw yield with stage seed bed with shallow tillage in tune of 9.53 percent. The favourable effect of conjunctive use of SSB using shallow on seed, straw and biological yield was due to significantly more dry matter accumulation, higher number of effective tillers per meter row length and seeds spike⁻¹ and was also due to less competition by weeds to wheat particularly of nutrient uptake by weeds. These results are in agreement with the findings of Kumar *et al.* (2016) [6]. The maximum net return was recorded with state seed bed technique with shallow tillage (Rs 61212) followed by conventional tillage (Rs 54910 ha⁻¹. The maximum B : C ratio was recorded with state seed bed technique with shallow tillage (1.33) followed by conventional tillage (1.28). The highest B: C ratio was found in SSB with shallow tillage this might be due to the lower cost of herbicide for weed control and increased the yield as deep tillage. These results are in corroborate the findings of Kumar *et al.* (2018) [7] and Safdar *et al.* (2011) [9].

Effect of weed management

The maximum number of effective tillers and seeds per spike were recorded with metsulfuron 4.0 g/ha at 30 DAS + one hand weeding at 45 DAS as compared to weedy check, and 2,4-D @ 0.5 kg/ha at 30 DAS and remained statistically at par with weed free and metsulfuron 4.0 g/ha at 30 DAS at 30, 60 DAS and harvest stage. The lowest value of yield attributes and yield may be due to severe competition by weeds for resources, (Light, moisture, nutrients and space) which made the crop plant incompetent to take up more moisture and nutrients, consequently growth was adversely affected. Poor growth and less uptake of nutrients in weedy check might have produced less photosynthates and partitioned less assimilates to numerous metabolic sink and ultimately poor development of yield components. The results are in concurrence with those obtained by Ram *et al.* (2004). The maximum seed, straw and biological yield were recorded with metsulfuron 4.0 g/ha at 30 DAS + one hand weeding at 45 DAS as compared to weedy check, and 2,4-D @ 0.5 kg/ha at 30 DAS and remained statistically at par with weed free and metsulfuron 4.0 g/ha at 30 DAS at 30, 60 DAS and harvest stage. The results of the present study are in close conformity with the finding of Pisal *et al.* (2013) [8]. There was no significant variation in harvest index among weed management treatment.

The highest net return of Rs 71426 percent was recorded with metsulfuron 4.0 g/ha at 30 DAS + one hand weeding at 45 DAS which were significantly higher to control and remained statistically at par with weed free and metsulfuron

4.0 g/ha at 30 DAS. The highest B : C ratio (1.56) was recorded with metsulfuron 4.0 g/ha at 30 DAS + one hand weeding at 45 DAS followed by metsulfuron 4.0 g/ha at 30 DAS (1.47), 2,4-D @ 0.5 kg/ha at 30 DAS (1.42) and control (0.48). This might be due to lower cost of cultivation to control of weed in metsulfuron at 4.0 g ha⁻¹ + one hand hoeing. Results of the present investigation corroborate the findings of Gopinath (2008) [2] and Jat *et al.* (2003) [5].

Table 1: Effect of tillage practices and weed management on effective tillers per meter row length and number of seeds per spike

Treatments	Effective tillers per meter row length	Number of seeds/spike
Tillage		
SSB using shallow tillage	82.80	38.22
Conventional tillage	75.93	34.64
SEm±	1.27	0.36
CD (P = 0.05)	3.67	1.13
Weed management		
Weedy check	69.17	31.20
Weed free	87.33	44.45
2,4-D @ 0.5 kg/ha at 30 DAS	76.50	35.28
Metsulfuron 4.0 g/ha at 30 DAS	78.83	37.48
Metsulfuron 4.0 g/ha at 30 DAS + one hand weeding at 45 DAS	85.00	39.90
SEm±	1.46	1.37
CD (P = 0.05)	4.39	3.86

Table 2: Effect of tillage practices and weed management on yields

Treatments	Seed yield (kg/ha)	Straw yield (kg/ha)	Biological yield (kg/ha)
Tillage			
SSB using shallow tillage	3342	3982	7324
Conventional tillage	3051	3574	6625
SEm±	49	72	121
CD (P = 0.05)	152	210	367
Weed management			
Weedy check	1918	2298	4216
Weed free	3860	4575	8434
2,4-D @ 0.5 kg/ha at 30 DAS	3223	3792	7015
Metsulfuron 4.0 g/ha at 30 DAS	3308	3907	7214
Metsulfuron 4.0 g/ha at 30 DAS + one hand weeding at 45 DAS	3673	4318	7991
SEm±	83	99	179
CD (P = 0.05)	249	296	556

Table 3: Effect of tillage practices and weed management on economics (Rs/ha)

Treatments	Gross return (Rs/ha)	Net return (Rs/ha)	B : C ratio
Tillage			
SSB using shallow tillage	106792	61212	1.33
Conventional tillage	97190	54910	1.28
SEm±	1641	1641	0.04
CD (P = 0.05)	4910	4910	0.13
Weed management			
Weedy check	61359	19909	0.48
Weed free	123220	75770	1.60
2,4-D @ 0.5 kg/ha at 30 DAS	102765	60315	1.42
Metsulfuron 4.0 g/ha at 30 DAS	105533	62883	1.47
Metsulfuron 4.0 g/ha at 30 DAS + one hand weeding at 45 DAS	117076	71426	1.56
SEm±	2629	2629	0.06
CD (P = 0.05)	7883	7883	0.18

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