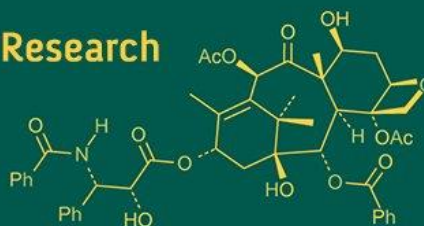


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
IJABR 2026; SP-10(5): 659-661
www.biochemjournal.com
Received: 23-02-2026
Accepted: 26-03-2026

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Effect of weed management on productivity of wheat (*Triticum aestivum* L.)

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DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i5Sh.8444>

Abstract

A field experiment entitled “Effect of Weed Management on Productivity of Wheat (*Triticum aestivum* L.)” was conducted on loamy sand soil at research farm, School of Agricultural, Suresh Gyan Vihar University, Jaipur, Rajasthan, during *rabi* 2025-26 seasons. The field experiment design was randomised block design with thirteen treatments. Wheat variety Raj 4037 was sown row spacing 20 cm and seed rate 100 kg ha⁻¹. Application pyrazosulfuron-ethyl 10 WP 25 g ha⁻¹ PE, pendimethalin 800 g ha⁻¹ fb pyrazosulfuron-ethyl 25 g ha⁻¹ (Early PoE 20 DAS), pyrazosulfuron-ethyl 10 WP 25 g ha⁻¹ (Early PoE 20 DAS), pyrazosulfuron-ethyl 10 WP 25 g ha⁻¹ PE and pendimethalin 800 g ha⁻¹ PE were found most superior and equally effective treatments that recorded significantly lower weed count than rest of treatments at 30, 60 DAS and at harvest.

The maximum effective tillers, spike length, seed spike⁻¹, seed and straw yield were recorded with application of Pendimethalin 800 g ha⁻¹ fb pyrazosulfuron-ethyl 25 g ha⁻¹ (Early PoE 20 DAS) which was significantly superior to weed check, one hand weeding at 25 DAS, Metsulphuron methyl 4 g ha⁻¹ PoE, Pendimethalin 800 g ha⁻¹ PE, Pyrazosulfuron-ethyl 10 WP 25 g ha⁻¹ (Early PoE 20 DAS) and remained statistically at par with Pyrazosulfuron-ethyl 10 WP 25 g ha⁻¹ PE, Pendimethalin + Pyrazosulfuron ethyl PE 785 g ha⁻¹ and weed free. Pendimethalin 800 g ha⁻¹ fb pyrazosulfuron-ethyl 25 g ha⁻¹ (Early PoE 20 DAS) was observed as the next superior and best herbicidal treatments by fetching the net return of Rs 123212 ha⁻¹.

Keywords: Metsulphuron, Pyrazosulfuron-ethyl, weeds, yields

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 (Tripathi *et al.*, 2017) [9]. Wheat is the backbone of food security of India. It is utilized for bread, cakes, cookies, noodles, petri-products and chapatti etc. Wheat grains contains starch 60-68%, protein 8-15%, fat 1.5-2.0%, cellulose 2.0-2.5%, and minerals 1.5-2.0% (Rathore, 2001) [7]. Wheat crop contributes substantially to the national food security by providing more than 50% of the calories to the people who mainly depend on it. 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). 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).

The yield of wheat is reduced by weeds by around 33% to 50%. One of the main reasons for low wheat output is weed infestation, which decreases wheat yield by 37-50% (Waheed *et al.*, 2009) [10]. Around 15-40% reduction in grain yield due to uncontrolled weeds reported by Jat *et al.*, (2003) [4]. The predominant weed flora found in wheat crop is comprised of *Phalaris minor*, *Avena ludoviciana*, *Chenopodium album*, *Melilotus india*, *Lathyrus aphaca* and *Rumex dentatus* (Yadav *et al.*, 2004) [11]. There are various methods of control and eradication of weeds viz. mechanical, biological and chemical but use of herbicides is the most popular method. Before 1970, weeds in wheat used to be controlled by manual labour but infestation of *Phalaris minor* in wheat crop necessitated the use of herbicides.

Methods and Materials

The experiment was conducted during *Rabi* 2025-26 at Agronomy farm, School of Agriculture, Suresh Gyan Vihar University, Jaipur. Geographically, the study area is located at 75°48'84" E longitude and 26°08'2'47" N latitude and this region falls under agro-climatic zone III A (Semi-arid Eastern Plain Zone) of Rajasthan. The present experiment consisting of nine treatments combination was laid out in randomized block design i.e. weedy check, weed free, One hand weeding 30 DAS, Metsulfuron methyl 4 g ha⁻¹ PoE, Pendimethalin 800 g ha⁻¹ PE, Pyrazosulfuron-ethyl 10 WP 25 g ha⁻¹ PE, Pyrazosulfuron-ethyl 10 WP 25 g ha⁻¹ (Early PoE 20 DAS), Pendimethalin + Pyrazosulfuron ethyl PE 785 g/ha and Pendimethalin fb pyrazosulfuron-ethyl 25 g/ha (Early PoE 20 DAS).

Results and Discussion

Pendimethalin + Pyrazosulfuron ethyl at PE 785 g ha⁻¹, Pendimethalin at 800 g ha⁻¹, Pyrazosulfuron-ethyl 10 WP 25 g ha⁻¹ PE, Pyrazosulfuron-ethyl 10 WP 25 g ha⁻¹ (Early PoE 20 DAS) and Pendimethalin 800 g ha⁻¹ PE increase the effective tiller in tune of 32.57, 28.44, 26.15 and 22.48 percent over weedy check. This might be due to better availability of nutrient, moisture, space and light which resulted better growth and development of plants similar finding also represented by Kaur *et al.*, (2023) [5]. Pendimethalin 800 g ha⁻¹ PE, Metsulphuron methyl 4 g ha⁻¹ PoE and one hand weeding remained statistically at par with each other and significantly superior over weedy check. Similar results also reported by Singh *et al.*, (2018) [8]. The highest spike length and grains spike⁻¹ were recorded with application of Pendimethalin 800 g ha⁻¹ fb pyrazosulfuron-ethyl 25 g ha⁻¹ (Early PoE 20 DAS) which was significantly superior over metsulphuron methyl 4 g ha⁻¹ PoE, Pendimethalin 800 g ha⁻¹ PE and one hand weeding and remained statistically at par with Pyrazosulfuron-ethyl 10 WP 25 g ha⁻¹ PE, Pyrazosulfuron-ethyl 10 WP 25 g ha⁻¹ (Early PoE 20 DAS and weed free. These results are well

corroborating with the findings of Sangeetha *et al.*, (2009) who reported that maximum weed growth in unweeded control resulted in lowest panicles per plant as well as grains per panicle. All weed management practices with resulted in a significant increase in wheat grain and straw yield over weedy check. The maximum seed and straw yield were recorded with application of Pendimethalin 800 g ha⁻¹ fb pyrazosulfuron-ethyl 25 g ha⁻¹ (Early PoE 20 DAS) which was significantly superior to weed check, one hand weeding at 25 DAS, Metsulfuron methyl 4 g ha⁻¹ PoE, Pendimethalin 800 g ha⁻¹ PE, Pyrazosulfuron-ethyl 10 WP 25 g ha⁻¹ (Early PoE 20 DAS) and remained statistically at par with Pyrazosulfuron-ethyl 10 WP 25 g ha⁻¹ PE, Pendimethalin + Pyrazosulfuron ethyl PE 785 g ha⁻¹ and weed free. This indicated that sequential application of some post-emergence herbicide (depending upon weed flora) is also required to achieve the potential yield. Similar finding also reported by Kaur *et al.*, (2023) [5].

Pendimethalin 800 g ha⁻¹ fb pyrazosulfuron-ethyl 25 g ha⁻¹ (Early PoE 20 DAS) was observed as the next superior and best herbicidal treatments by fetching the net return of Rs 123212. The increase of net return in percentage in tune of 3.46, 3.31 and 3.03 times more by pendimethalin 800 g ha⁻¹ fb pyrazosulfuron-ethyl 25 g ha⁻¹ (Early PoE 20 DAS), Pendimethalin + Pyrazosulfuron ethyl PE 785 g ha⁻¹ and Pyrazosulfuron-ethyl 10 WP 25 g ha⁻¹ PE as compared to weedy check. Results of the present investigation corroborate the findings of Gopinath, (2008) [1], Jat *et al.*, (2003) [4]. The highest BCR 4.36 was recorded with pendimethalin 800 g ha⁻¹ fb pyrazosulfuron-ethyl 25 g ha⁻¹ (Early PoE 20 DAS) followed by Pendimethalin + Pyrazosulfuron ethyl PE 785 g ha⁻¹ (4.24), Pyrazosulfuron-ethyl 10 WP 25 g ha⁻¹ PE (4.05), Pyrazosulfuron-ethyl 10 WP 25 g ha⁻¹ (Early PoE 20 DAS) (4.02), Pendimethalin 800 g ha⁻¹ PE (3.87) and Metsulphuron methyl 4 g ha⁻¹ PoE (3.86). similar finding also reported by Nagarjun and Dhanapal, (2018) [6].

Table 1: Effect of weed control measures on yield attributes

Treatments	Effective tillers (per meter row length)	Spike length (cm)	Grain spike ⁻¹
Weed free	102.33	6.43	39.33
Weedy check	72.67	5.47	27.13
One hand Weeding 25 DAS	87.00	5.80	34.67
Metsulphuron methyl 4 g ha ⁻¹ PoE	90.00	5.87	35.33
Pendimethalin 800 g ha ⁻¹ PE	92.00	5.90	36.00
Pyrazosulfuron-ethyl 10 WP1 25 g ha ⁻¹ PE	95.00	6.17	38.00
Pyrazosulfuron-ethyl 10 WP 25 g ha ⁻¹ (Early PoE 20 DAS)	93.33	6.20	37.00
Pendimethalin + Pyrazosulfuron ethyl PE 785 g ha ⁻¹	96.33	6.27	38.00
Pendimethalin 800 g ha ⁻¹ fb pyrazosulfuron-ethyl 25 g ha ⁻¹ (Early PoE 20 DAS)	98.33	6.47	38.67
SEm±	3.38	0.19	1.24
CD at 5%	10.13	0.57	3.72

Table 2: Effect of weed control measures on Yields (kg ha⁻¹)

Treatments	Seed yield (kg/ha)	Straw yield (kg/ha)	Biological yield (kg/ha)	HI (%)
Weed free	5258.0	6658.3	11916.3	44.13
Weedy check	1932.7	2415.8	4348.5	44.44
One hand Weeding 25 DAS	4007.3	5087.5	9094.8	44.09
Metsulphuron methyl 4 g ha ⁻¹ PoE	4240.0	5355.0	9595.0	44.21
Pendimethalin 800 g ha ⁻¹ PE	4326.7	5475.0	9801.7	44.14
Pyrazosulfuron-ethyl 10 WP 25 g ha ⁻¹ PE	4510.0	5683.2	10193.2	44.25
Pyrazosulfuron-ethyl 10 WP 25 g ha ⁻¹ (Early PoE 20 DAS)	4470.0	5672.5	10142.5	44.08
Pendimethalin + Pyrazosulfuron ethyl PE 785 g ha ⁻¹	4746.7	5994.2	10740.8	44.20
Pendimethalin 800 g ha ⁻¹ fb pyrazosulfuron-ethyl 25 g ha ⁻¹ (Early PoE 20 DAS)	4866.7	6150.0	11016.7	44.18
SEm±	124.6	169.6	289.8	0.25
CD at 5%	373.5	508.5	868.8	NS

Table 3: Effect of weed control measures on return (Rs ha⁻¹)

Treatments	Gross return (Rs ha ⁻¹)	Net return (Rs ha ⁻¹)	BCR
Weed free	172886	132086	2.50
Weedy check	63295	27595	0.58
One hand Weeding 25 DAS	131867	93617	1.66
Metsulfuron methyl 4 g ha ⁻¹ PoE	139300	103255	2.03
Pendimethalin 800 g ha ⁻¹ PE	142232	105477	2.05
Pyrazosulfuron-ethyl 10 WP 25 g ha ⁻¹ PE	148068	111463	2.23
Pyrazosulfuron-ethyl 10 WP 25 g ha ⁻¹ (Early PoE 20 DAS)	147073	110518	2.20
Pendimethalin + Pyrazosulfuron ethyl PE 785 g ha ⁻¹	155940	119135	2.42
Pendimethalin 800 g ha ⁻¹ fb pyrazosulfuron-ethyl 25 g ha ⁻¹ (Early PoE 20 DAS)	159917	123212	2.54
SEm±	4135	3898	0.11
CD at 5%	12397	11583	0.33

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