



International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
© Agronomy
NAAS Rating (2026): 5.20
www.agronomyjournals.com
2026; 9(9): 567-570
Received: 11-06-2026
Accepted: 15-07-2026

Renu Jayant

Ph.D. Scholar, Department of
Agronomy, Jawaharlal Nehru
Krishi Vishwa Vidyalaya,
Jabalpur, Madhya Pradesh, India

Anay K Rawat

Department of Agronomy,
Jawaharlal Nehru Krishi Vishwa
Vidyalaya, Jabalpur, Madhya
Pradesh, India

Rajendra Prasad Sahu

Department of Agronomy,
Jawaharlal Nehru Krishi Vishwa
Vidyalaya, Jabalpur, Madhya
Pradesh, India

Indar Raj Naga

Ph.D. Scholar, Department of Soil
Science and Agricultural
Chemistry, Jawaharlal Nehru
Krishi Vishwa Vidyalaya,
Jabalpur, Madhya Pradesh, India

Residual effect of wheat herbicides on establishment, growth and yield of succeeding summer greengram

Renu Jayant, Anay K Rawat, Rajendra Prasad Sahu and Indar Raj Naga

DOI: <https://www.doi.org/10.33545/2618060X.2026.v9.i9h.6556>

Abstract

A field experiment was conducted to assess the residual effect of herbicides applied in preceding wheat on the growth and yield of succeeding summer greengram. The experiment was conducted during 2024-25 and 2025-26 using different herbicide treatments applied to wheat, followed by greengram in the same plots. The results showed that the residual effect of the tested herbicides was non-significant for plant population, plant height, chlorophyll content and seed yield of succeeding greengram. However, numerical differences were observed among the treatments. The highest numerical plant population, plant height and chlorophyll content were recorded under hand weeding, while the highest numerical seed yield was recorded with clodinafop-propargyl + metsulfuron-methyl (1136 kg ha⁻¹). The lowest values for most parameters were observed under the weedy check. Overall, the study indicated that the herbicides applied in preceding wheat did not produce any appreciable adverse residual effect on the growth and yield of succeeding summer greengram under the conditions of the experiment.

Keywords: Carry-over effect, crop rotation, greengram, herbicide residue, summer residual, toxicity, wheat

Introduction

In India, cereal-pulse cropping systems heavily rely on wheat (*Triticum aestivum* L.), a significant cereal crop. Summer greengram (*Vigna radiata* L.) is an important short-duration pulse crop that can be successfully grown after wheat and contributes to soil fertility through biological nitrogen fixation. The wheat-greengram cropping sequence is therefore an important option for improving land use efficiency, farm productivity and sustainability. Weeds are one of the major constraints to wheat production and can cause considerable losses in crop growth and yield. Herbicides are widely used for effective and timely weed management in wheat, particularly where manual weeding is costly and labour availability is limited (Singh *et al.*, 2012; Yadav *et al.*, 2019) [4, 6]. However, the use of herbicides in one crop may result in residues persisting in the soil and may influence the establishment and growth of the succeeding crop.

Herbicide characteristics, application rate, soil pH, moisture, temperature, and microbial degradation are some of the variables that affect herbicide carry-over and persistence. While certain popular herbicides have been shown to be safe for greengram and other rotating crops, previous research has also demonstrated that some herbicides applied to wheat may produce residual harm to subsequent crops. (Yadav *et al.*, 2004; Zahan *et al.*, 2018) [5, 8]. Therefore, evaluation of the residual effect of used herbicide treatments in wheat is important for ensuring the safe establishment and productivity of the succeeding summer greengram crop. The present study was undertaken to assess the residual effects of herbicides applied in preceding wheat on the growth and yield of succeeding summer greengram under the prevailing agro-ecological conditions.

Materials and Methods

A field experiment was conducted during the summer seasons of 2024-25 and 2025-26 to evaluate the residual effect of herbicides applied in the preceding wheat crop on succeeding summer greengram. The experiment comprised nine treatments, including different herbicides applied in wheat, hand weeding and a weedy check. The herbicide treatments included pyroxasulfone, pinoxaden, metsulfuron methyl, clodinafop-propargyl, clodinafop-propargyl + metribuzin, 2,4-D

Corresponding Author:

Renu Jayant

Ph.D. Scholar, Department of
Agronomy, Jawaharlal Nehru
Krishi Vishwa Vidyalaya,
Jabalpur, Madhya Pradesh, India

+ carfentrazone and clodinafop-propargyl + metsulfuron methyl. Hand weeding and weedy check were maintained as comparative treatments. After harvesting the wheat crop, summer greengram was sown in the same plots without disturbing the soil. The recommended dose of fertilizers and other agronomic practices were followed uniformly for all treatments. Observations on plant population, plant height, chlorophyll content, yield attributes and seed yield were recorded at different growth stages of greengram. Plant population was recorded at 15 days after sowing and at harvest, while plant height and chlorophyll content were measured at 40, 60 days after sowing and at harvest. The residual effect of the herbicides was assessed by comparing the growth and yield performance of greengram under different preceding wheat herbicide treatments. The data were statistically analysed using analysis of variance for randomized block design. Treatment means were compared using the critical difference at the 5% level of significance.

Results and Discussion

Plant Population

The data on plant population of succeeding summer greengram at 15 DAS and at harvest are presented in Table 1. Plant population

did not differ significantly among the treatments during either year of experimentation. At 15 DAS, the mean plant population ranged from 108.92 to 113.04 plants m^{-2} . Numerically, the highest population was recorded under hand weeding (T_8) with 113.04 plants m^{-2} , followed by clodinafop-propargyl + metsulfuron-methyl (T_7) with 112.72 plants m^{-2} , whereas the lowest population was observed under the weedy check (T_9) with 108.92 plants m^{-2} . A similar trend was observed at harvest, where plant population ranged from 108.00 to 111.52 plants m^{-2} . The absence of significant differences indicates that the herbicides applied in the preceding wheat crop did not adversely affect the establishment or survival of succeeding greengram. Similar findings were reported by Yadav *et al.* (2004) ^[5], who observed no adverse carry-over effect of several wheat applied herbicides on succeeding greengram. Zahan *et al.* (2018) ^[8] and Shamim *et al.* (2020) ^[3] also reported that herbicide residues from wheat did not adversely affect the establishment of succeeding greengram. Hossain *et al.* (2022) ^[1] further reported that different herbicide treatments had no significant effect on greengram plant population, root and shoot growth, biomass, seed yield or seed germination.

Table 1: Plant population of succeeding summer greengram as influenced by herbicides applied in preceding wheat

	Treatments	Plant population (m^{-2})					
		15 DAS			At harvest		
		2024-25	2025-26	Mean	2024-25	2025-26	Mean
T_1	Pyroxasulfone 85% WG @ 127.5 g a.i. ha^{-1} (PE)	109.32	111.03	110.17	108.99	110.79	109.89
T_2	Pinoxaden 5.1% EC @ 40 g a.i. ha^{-1} (PoE)	110.15	110.75	110.45	109.82	110.30	110.06
T_3	Metsulfuron methyl 20% WP @ 4 g a.i. ha^{-1} (PoE)	109.34	110.09	109.72	109.01	109.47	109.24
T_4	Clodinafop propargyl 15% WP @ 60 g a.i. ha^{-1} (PoE)	109.98	110.19	110.08	109.51	111.41	110.46
T_5	Clodinafop Propargyl 9% + Metribuzin 20% WP @ 54+120 g a.i. ha^{-1} (PoE)	111.16	112.95	112.05	110.80	111.45	111.12
T_6	2,4-D dimethyl ammonium salt 58% SL + Carfentrazone 40% WDG @ 500 + 20 g a.i. ha^{-1} (PoE)	110.82	111.85	111.33	110.28	111.41	110.85
T_7	Clodinafop propargyl 15%WP + Metsulfuron methyl 20%WP @ 60+4 g a.i. ha^{-1} (PoE)	112.00	113.45	112.72	111.29	112.04	111.67
T_8	Hand weeding @ 20 and 40 DAS	112.13	113.95	113.04	111.30	111.75	111.52
T_9	Weedy check	108.80	109.04	108.92	107.77	108.24	108.00
	S.Em.($\pm$)	4.94	4.87	4.90	4.95	5.07	5.01
	CD ($P=0.05$)	NS	NS	NS	NS	NS	NS

Plant Height

Plant height of succeeding summer greengram was recorded at 40 DAS, 60 DAS and at harvest (Table 2). The effect of herbicide treatments applied to the preceding wheat crop was non-significant at all stages of observation. At 40 DAS, mean plant height ranged from 14.07 cm weedy check (T_9) to 17.57 cm under clodinafop-propargyl + metsulfuron-methyl (T_7). At 60 DAS, the maximum numerical height was recorded under hand weeding (T_8) with 26.70 cm, followed by clodinafop-propargyl + metsulfuron-methyl (T_7) with 26.33 cm. At harvest, hand weeding (T_8) recorded the highest numerical plant height of 41.41 cm, followed by clodinafop-propargyl + metsulfuron-methyl (T_7) with 41.14 cm, whereas the lowest value was recorded under the weedy check (T_9) with 28.87 cm. Since the differences were statistically non-significant, the observed variation should be considered numerical rather than a residual phytotoxic response greengram. These findings are in agreement with Yadav *et al.* (2019) ^[6], who reported that herbicides applied in wheat did not show residual toxicity on the plant height of succeeding. Jain *et al.* (2020) ^[2], who reported no harmful residual effect of wheat herbicides on succeeding greengram. Similarly, Yadav *et al.* (2021) ^[7] reported that herbicide mixtures applied in wheat did not show residual toxicity on succeeding greengram and other predominant legume crops grown after wheat. Yadav *et al.* (2019)

^[6] also reported that herbicides and herbicide mixtures used in wheat did not adversely influence the performance of succeeding crops.

Chlorophyll Content

Chlorophyll content of succeeding summer greengram was not significantly affected by the herbicide treatments applied in the preceding wheat crop (Table 3). The mean values ranged from 39.33 to 46.07. Numerically, the highest chlorophyll content was recorded under hand weeding (T_8) with 46.07, followed by clodinafop-propargyl + metsulfuron-methyl (T_7) with 45.70, while the lowest value was recorded under the weedy check (T_9) with 39.33. The higher numerical chlorophyll content under T_7 and T_8 was consistent with their comparatively better plant growth. However, the differences were statistically non-significant, indicating that the tested herbicides did not cause appreciable residual toxicity affecting the chlorophyll status of succeeding greengram. Similar observations were reported by Zahan *et al.* (2018) ^[8], who found that chlorophyll content and dry matter of succeeding greengram were not adversely affected by residues of herbicides applied in wheat. Shamim *et al.* (2020) ^[3] also reported no adverse effect of wheat applied herbicide residues on greengram growth and chlorophyll content.

Table 2: Plant height of succeeding summer greengram as influenced by herbicides applied in preceding wheat

	Treatments	Plant Height (cm)								
		40 DAS			60DAS			At harvest		
		2024-25	2025-26	Mean	2024-25	2025-26	Mean	2024-25	2025-26	Mean
T ₁	Pyroxasulfone 85% WG @ 127.5 g a.i. ha ⁻¹ (PE)	15.87	16.57	16.22	18.91	18.98	18.94	29.48	30.01	29.75
T ₂	Pinoxaden 5.1% EC @ 40 g a.i. ha ⁻¹ (PoE)	16.43	16.52	16.48	22.50	22.76	22.63	32.05	32.23	32.14
T ₃	Metsulfuron methyl 20% WP @ 4 g a.i. ha ⁻¹ (PoE)	14.32	14.44	14.38	19.51	19.78	19.64	26.13	26.58	26.35
T ₄	Clodinafop propargyl 15% WP @ 60 g a.i. ha ⁻¹ (PoE)	16.40	15.65	16.02	21.13	21.25	21.19	29.00	29.81	29.41
T ₅	Clodinafop Propargyl 9% + Metribuzin 20% WP @ 54+120 g a.i. ha ⁻¹ (PoE)	16.54	16.40	16.47	25.50	25.72	25.61	37.23	37.46	37.35
T ₆	2,4-D dimethyl ammonium salt 58% SL + Carfentrazon 40% WDG @ 500 + 20 g a.i. ha ⁻¹ (PoE)	16.45	17.38	16.91	24.38	24.94	24.66	36.04	36.46	36.25
T ₇	Clodinafop propargyl 15%WP + Metsulfuron methyl 20%WP @ 60+4 g a.i. ha ⁻¹ (PoE)	17.00	18.14	17.57	26.17	26.48	26.33	40.99	41.28	41.14
T ₈	Hand weeding @ 20 and 40 DAS	16.97	17.16	17.06	26.54	26.86	26.70	41.23	41.60	41.41
T ₉	Weedy check	13.79	14.36	14.07	18.70	18.88	18.79	28.78	28.97	28.87
	S.Em.(±)	0.75	0.98	0.84	2.00	2.07	1.37	3.56	3.48	2.90
	CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 3: Chlorophyll content of succeeding summer greengram as influenced by herbicides applied in preceding wheat

	Treatments	Chlorophyll content		
		2024-25	2025-26	Mean
T ₁	Pyroxasulfone 85% WG @ 127.5 g a.i. ha ⁻¹ (PE)	42.10	42.97	42.54
T ₂	Pinoxaden 5.1% EC @ 40 g a.i. ha ⁻¹ (PoE)	43.25	43.78	43.51
T ₃	Metsulfuron methyl 20% WP @ 4 g a.i. ha ⁻¹ (PoE)	42.55	42.94	42.75
T ₄	Clodinafop propargyl 15% WP @ 60 g a.i. ha ⁻¹ (PoE)	42.95	43.73	43.34
T ₅	Clodinafop Propargyl 9% + Metribuzin 20% WP @ 54+120 g a.i. ha ⁻¹ (PoE)	45.05	45.79	45.42
T ₆	2,4-D dimethyl ammonium salt 58% SL + Carfentrazon 40% WDG @ 500 + 20 g a.i. ha ⁻¹ (PoE)	44.10	43.80	43.95
T ₇	Clodinafop propargyl 15%WP + Metsulfuron methyl 20%WP @ 60+4 g a.i. ha ⁻¹ (PoE)	45.60	45.80	45.70
T ₈	Hand weeding @ 20 and 40 DAS	46.05	46.08	46.07
T ₉	Weedy check	39.35	39.30	39.33
	S.Em.(±)	1.39	1.36	1.00
	CD (P=0.05)	NS	NS	NS

Seed Yield

Seed yield of succeeding summer greengram was not significantly influenced by the herbicide treatments applied to the preceding wheat crop (Table 4). The mean yield ranged from 833 to 1136 kg ha⁻¹. The highest numerical seed yield was recorded under clodinafop-propargyl + metsulfuron-methyl (T₇) with 1136 kg ha⁻¹, followed by hand weeding (T₈) with 1130 kg ha⁻¹, while the lowest yield was recorded under the weedy check (T₉) with 833 kg ha⁻¹. The better numerical performance under T₇ and T₈ was associated with comparatively better crop growth, whereas the lower yield under the weedy check may be related to

greater weed interference in the preceding cropping system. However, as the treatment effect was non-significant, these numerical differences cannot be attributed to a significant residual effect of the herbicides. Yadav *et al.* (2019) [6] similarly reported that herbicides applied in wheat did not produce residual toxicity in succeeding greengram. Earlier, Yadav *et al.* (2004) [5] also reported that several herbicides used in wheat did not adversely affect succeeding greengram. Yadav *et al.* (2021) [7] also observed no residual toxicity of herbicides and herbicide mixtures applied in wheat on succeeding legume crops, including mungbean.

Table 4: Seed yield of succeeding summer greengram as influenced by herbicides applied in preceding wheat

	Treatments	Yield (kg/ha)		
		2024-25	2025-26	Mean
T ₁	Pyroxasulfone 85% WG @ 127.5 g a.i. ha ⁻¹ (PE)	850	861	855
T ₂	Pinoxaden 5.1% EC @ 40 g a.i. ha ⁻¹ (PoE)	1009	1020	1014
T ₃	Metsulfuron methyl 20% WP @ 4 g a.i. ha ⁻¹ (PoE)	917	928	922
T ₄	Clodinafop propargyl 15% WP @ 60 g a.i. ha ⁻¹ (PoE)	956	968	962
T ₅	Clodinafop Propargyl 9% + Metribuzin 20% WP @ 54+120 g a.i. ha ⁻¹ (PoE)	1117	1129	1123
T ₆	2,4-D dimethyl ammonium salt 58% SL + Carfentrazon 40% WDG @ 500 + 20 g a.i. ha ⁻¹ (PoE)	1115	1128	1122
T ₇	Clodinafop propargyl 15%WP + Metsulfuron methyl 20%WP @ 60+4 g a.i. ha ⁻¹ (PoE)	1130	1143	1136
T ₈	Hand weeding @ 20 and 40 DAS	1123	1136	1130
T ₉	Weedy check	828	838	833
	S.Em.(±)	82.19	82.10	82.15
	CD (P=0.05)	NS	NS	NS

Conclusion

The study revealed that the herbicides applied in the preceding wheat crop had no significant residual effect on the establishment, growth, chlorophyll content and seed yield of succeeding summer

greengram. Plant population, plant height and chlorophyll content remained statistically comparable among the treatments. Although numerical differences were observed, clodinafop-propargyl + metsulfuron-methyl (T₇) and hand weeding (T₈)

generally recorded better crop performance, while the weedy check (T_9) showed comparatively lower values. The highest numerical seed yield was recorded under T_7 (1136 kg ha^{-1}), followed by T_8 (1130 kg ha^{-1}), whereas the lowest was observed under T_9 (833 kg ha^{-1}). Overall, the findings indicate that the tested wheat herbicide treatments did not cause measurable residual phytotoxicity to succeeding summer greengram under the conditions of the study.

References

1. Hossain M, Begum M, Bell R, Hashem A, Rahman M, Ahmed S. Plant bioassays to detect herbicide residues in intensive rice-based cropping patterns under conservation agriculture. 2022.
2. Jain LK, Ram M, Parewa HP. Chemical weed control in wheat (*Triticum aestivum*) and its residual effects on greengram (*Vigna radiata*). Indian Journal of Agronomy. 2020;65(2):231-234.
3. Shamim MS, Mia MSR, Hossain MN, Ahmed T, Haque MK. Response of mungbean to the residual toxicity of herbicides used in wheat under strip tillage system. Asian Journal of Agricultural and Horticultural Research. 2020;5(2):23-31.
4. Singh R, Shyam R, Singh VK, Kumar J, Yadav SS, Rathi SK. Evaluation of bioefficacy of clodinafop-propargyl + metsulfuron-methyl against weeds in wheat. Indian Journal of Weed Science. 2012;44(2):81-83.
5. Yadav A, Malik RK, Punia SS, Mehta R, Bir D. Studies on carry-over effects of herbicides applied in wheat on the succeeding crops in rotation. Indian Journal of Weed Science. 2004;36(1-2):15-18.
6. Yadav HL, Gupta AK, Kumar S, Gupta S. Comparative efficacy of herbicides applied in wheat and their residual effect on the succeeding crops. International Journal of Current Microbiology and Applied Sciences. 2019;8(4):1866-1874.
7. Yadav HL, Gupta AK, Choudhary RR. Effect of different herbicide mixtures on performance in wheat and their residual effect on legume crops. Journal of Plant Development Sciences. 2021;13(7):513-517.
8. Zahan T, Muktadir MA, Rahman MM, Ahmed MM. Response of the succeeding crops as affected by the residue of herbicides applied in wheat in Old Brahmaputra Floodplain, Bangladesh. Annals of Agrarian Science. 2018;16(4):451-457.