E-ISSN: 2618-0618
P-ISSN: 2618-060X
© Agronomy
NAAS Rating (2025): 5.20
www.agronomyjournals.com
2025; 8(9): 431-434
Received: 16-07-2025
Accepted: 19-08-2025

Anand Abhishek
M.Sc. student, Agronomy, FASAI, Rama University Kanpur, Uttar Pradesh, India

Abdul Fahim Khan
M.Sc. student, Agronomy, FASAI, Rama University Kanpur, Uttar Pradesh, India

Mandeep Kumar
Assistant Professor, Department of Agronomy, FASAI, Rama University Kanpur, Uttar Pradesh, India

Ravikesh Kumar Pal
Assistant Professor, Department of Agronomy, FASAI, Rama University Kanpur, Uttar Pradesh, India

Raghvendra Singh
Assistant Professor Soil Science, FASAI, Rama University Kanpur, Uttar Pradesh, India

Corresponding Author:
Anand Abhishek
M.Sc. student, Agronomy, FASAI, Rama University Kanpur, Uttar Pradesh, India

Studies on integrated weed management in greengram (*Vigna radiata* L.)

Anand Abhishek, Abdul Fahim Khan, Mandeep Kumar, Ravikesh Kumar Pal and Raghvendra Singh

DOI: https://www.doi.org/10.33545/2618060X.2025.v8.i9f.3796

Abstract
An experiment entitled "Integrated weed management in kharif Green Gram (*Vigna radiata* L)" was carried out during kharif 2024 at students Instructional Farm of Rama University, Kanpur Nagar, Uttar Pradesh. The soil of the experimental field was sandy loam, having pH of 6.5, low in organic carbon content (0.39), low in available nitrogen (210.42 kg ha^{-1}) medium in available phosphorus (12.21 kg ha^{-1}), and medium in available potassium (266.68 kg ha^{-1}). The experiment was laid out in Randomized Block Design consisting of 8 treatments and three replications *viz*, Unwedded control, Two hand weeding at 20 and 40 DAS, Pendimethalin 30 EC @ 1kg ha^{-1} as PE, Pendimethalin 30 EC @ 1 kg ha^{-1} as PE + one hand weeding at 20 DAS, Quizalofopethyl 5 EC @ 50g ha- 1 at 20 DAS as PoE, Imazethapyr 10 SL @ 100ml ha^{-1} at 20 DAS as PoE, Pendimethalin 30 EC @ 1kg ha^{-1} as PE + Quizalofopethyl 5 EC @ 50g ha^{-1} at 20 DAS as PoE, Pendimethalin 30 EC @ 1kg ha^{-1} as PE + Imazethapyr 10 SL @ 100ml ha^{-1} at 20 DAS as PoE. The results indicated that the highest grain (10.67 q ha^{-1}) and straw (23.84 q ha^{-1}) yields were obtained by two hand weeding at 20 and 40 DAS, followed by Pendimethalin 30 EC @ 1 kg ha^{-1} as PE + one hand weeding at 20 DAS (10.03, 23.09 q ha^{-1}). The prevalent weeds in the experimental field were grasses like *Cynodon dactylion* and *Echinochloa colonum*, sedges like *Cyperus rotundus* and broad-leaved weeds like *Trian Thema monogyna* and *Amaranthus viridis*. Pendimethalin 30 EC @ 1 kg ha^{-1} as PE + one hand weeding at 20 DAS showed the best results after two hand weeding treatments in terms of weed control effectiveness (82.16%), lowest weed index (6.01%), weed density (7.75 no m-2) and weed dry weight (4.59 g m-2). In comparison to other weed control techniques, this treatment also recorded the maximum plant growth characteristics and yield attributes. The maximum net return per rupee invested was obtained with Pendimethalin 30 EC @ 1 kg ha^{-1} as PE + one hand weeding at 20 DAS (2.39).

Keywords: Greengram (*Vigna radiata*), Integrated weed management, Herbicides

Introduction
Pulses are an excellent source of protein, carbohydrates, dietary fiber, vitamins, minerals, and phytochemicals, making them a vital component of human nutrition, particularly in developing countries (USDA, 2020) [16]. The lysine-rich protein of pulses serves as a natural supplement to cereals, which are typically deficient in this essential amino acid (Anonymous, 2024) [4]. For centuries, pulses have also functioned as "biological fertilizer factories," enriching the soil through biological nitrogen fixation, addition of organic matter, and reduction in the dependence on synthetic fertilizers (Ahirwar *et al*., 2016) [1]. Their inclusion in cereal-based crop rotations improves soil fertility, breaks pest and disease cycles, and enhances sustainability in farming systems (Ghanshyam *et al*., 2010) [8]. Pulses contribute nearly 14% of the total protein in the average Indian diet and act as the principal source of dietary protein for resource-poor populations (GOI, 2021-22) [9]. With the recommended dietary allowance (RDA) for protein being 0.8 g/kg body weight for adults, increased pulse production is a critical step toward ensuring nutritional security (Ali *et al*., 2011) [2].
India is the world's largest producer, consumer, and importer of pulses, with Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh, and Karnataka being the leading pulse-producing states (Bahadur & Tiwari, 2014) [5]. The country cultivates a wide range of pulses, including chickpea, pigeon pea, mungbean, black gram, lentil, and kidney beans. Of these, chickpea and pigeon pea dominate, accounting for nearly 60% of total production (GOI, 2021-22) [9]. Pulses are

cultivated in three distinct seasons: *rabi* (gram, lentil, pea, lathyrus, rajmash), *kharif* (pigeon pea, green gram, cowpea, horse gram), and summer (green gram, black gram, cowpea, horse gram). Notably, more than 60% of pulse production comes from *rabi* pulses (Kumari *et al*., 2015) [12].

Green gram (*Vigna radiata* L.), also called mungbean or golden gram, is the fourth most important pulse crop in India. It is cultivated mainly in arid and semi-arid regions and accounts for about 1.6% of the total pulse acreage (Gupta *et al*., 2016) [10]. Being a short-duration crop, it can be successfully grown on well-drained loamy to sandy loam soils and is often included as a catch crop between *rabi* and *kharif* seasons (Choudhary & Yadav, 2011) [7]. It is moderately tolerant of drought, grows 40-120 cm in height, and has trifoliate leaves with hairy surfaces. Its pods are usually 4-16 cm long, cylindrical to slightly curved, and contain small globular seeds that may be green, yellow, brown, or black speckled (Mohammad *et al*., 2017) [13].

Nutritionally, green gram is regarded as a high-quality pulse due to its superior digestibility and high protein content (20-28%). Its protein fraction is rich in lysine and tryptophan, often earning it the title "queen of pulses" (Amit *et al*., 2019) [3]. In addition, it contains 55-60% carbohydrates, 1.0-1.5% fat, 3.5-4.5% fiber, and 4.5-5.5% ash (USDA, 2020) [16]. Despite its nutritional and economic importance, the productivity of green gram is severely constrained by weed infestation. Weeds compete aggressively with the crop for nutrients, light, water, and space during the critical early growth stages, leading to yield reductions of 30-80% depending on the season and weed flora (Chaudhari *et al*., 2016; Singh, 1993) [6, 14]. Studies have shown that weed-induced yield losses can reach as high as 85% in the absence of timely management (Singh *et al*., 2015) [15]. Thus, integrated weed management (IWM) strategies that combine cultural, mechanical, chemical, and biological measures are crucial for achieving sustainable production of green gram (Khan & Joergensen, 2019) [11].

In this context, the present investigation entitled "Study on Integrated Weed Management in Green Gram (*Vigna radiata* L.)" was conducted during the *kharif* season of 2024 at the Student's Instructional Farm, Rama University, Kanpur Nagar, with the following objectives:

1. To assess the effect of different weed control measures on the density and biomass production of weeds.
2. To evaluate the impact of weed management practices on the growth and yield of green gram.
3. To determine the economic feasibility of different weed control treatments.

Location of Experimental site

A field experiment entitled on "Study of Integrated Weed Management in Green gram (*Vigna radiata* L.)" was conducted during kharif season of 2024 at Students Instructional Farm, Department of Agronomy, Rama University, Kanpur, India. The materials and methods used in the present experiment, soil properties, climatic condition, experimental site, experimental details and the design of experiment adopted, statistical analysis and sampling techniques.

adopted are dealt in this chapter under the following heads. The current study was conducted in Kharif 2024 at Students Instructional Farm, Department of Agronomy, Rama University, Kanpur. Geographically Kanpur falls under sub - tropical semi-arid tract of North India, located at 25°56' to 28°58' North latitude and 79°31' to 80°34' East longitude with a mean sea level of 125.9 m. The City lies in India's upper Indo-Gangetic plain zone, located in the Central Plain Zone of Uttar Pradesh, on the right bank of the holy Ganga River. The experimental plot had an even topography and good drainage facility. Kanpur has a tropical climate with warm, humid monsoons, reasonably hot summers, and mildly cold winters. This area typically experiences heavy rainfall from June to September Therefore, Pendimethalin 30 EC @ 1 kg ha^{-1} as PE + one hand weeding at 20 DAS revealed to be an effective treatment in terms of B: C ratio and net return.

Effect on density and dry matter of grassy weeds

The data present in table -1 revealed how various weed management techniques at 30 and 60 DAS affected the density of grassy weeds. The results showed that two hand weeding treatment had the lowest recorded weed density (3.7 and 4 m^{-2}) was followed by Pendimethalin 30 EC @ 1 kg ha^{-1} as PE + one hand weeding (3.9 and 4.9 m^{-2}), Pendimethalin 30 EC @ 1kg ha^{-1} as PE + Imazethapyr 10 SL @ 100ml ha^{-1} as PoE (4.4 and 5.26 m-2). The highest weed density recorded in unweeded control treatment (8.9 and 10.84 m^{-2}). Among the herbicide treatments, integrated weed management treatment like Pendimethalin 30 EC @ 1 kg ha^{-1} as PE + one hand weeding proved to be the most successful in reducing grass density as compared to application of pre or post emergence herbicides only.

Effect on dry matter of grasses

The data present in unambiguously show that, at 30 and 60 DAS, various weed management techniques had an impact on the dry matter of grassyweeds. Significantly, it was observed that the two hand weeding treatments recorded the lowest dry matter (2.21 and 2.33g m- 2) and were succeeded by Pendimethalin 30 EC @ 1 kg ha^{-1} as PE + one hand weeding (2.29 and 3.2 g m-2), Pendimethalin 30 EC @ 1 kg ha^{-1} as PE + Imazethapyr 10 SL @ 100ml ha^{-1} as PoE (2.42 and 3.29 g m-2). The maximum dry matter recorded in unweeded control treatment (5.61 and 7.37 g m-2). Among herbicide combinations, Pendimethalin 30 EC @ 1 kg ha^{-1} as PE + one manual weeding proved to be the most successful treatment for reducing the dry matter of grasses at 30 and 60 DAS.

Effect on density and dry matter of sedges

The data clearly show that, at 30 and 60 DAS, different weed management strategies had an impact on the density of sedges. Significantly, it was found that two hand weeding treatment had the lowest recorded weed density (2.56 and 2.84 m-2). This was followed by Pendimethalin 30 EC @ 1 kg ha^{-1} as PE + one hand weeding (2.79 and 2.86 m-2),

Pendimethalin 30 EC @ 1 kg ha^{-1} as PE + Imazethapyr 10 SL @ 100ml ha- 1 as PoE (3.45 and 3.12 m-2). The highest weed density recorded in unweeded control treatment (5.35 and 7.55 m-2). Among the herbicide treatments, integrated weed management treatment like Pendimethalin 30 EC @ 1 kg ha^{-1} as PE + one hand weeding proved to be the most successful in minimizing density of sedges as compared to application of pre or post emergence herbicides only.

Effect on dry matter of sedge

The data clearly showed that, at 30 and 60 DAS, different weed management strategies affect the dry matter of sedges. Significantly, it was observed that the two hand weeding treatments recorded the lowest dry matter (1.81 and 1.7g m-2) and were succeeded by Pendimethalin 30 EC @ 1 kg ha^{-1} as PE + one hand weeding (1.83 and 2 g m-2), Pendimethalin 30 EC @ 1 kg ha^{-1} as PE + Imazethapyr 10 SL @ 100ml ha^{-1} as PoE (2.01 and 2.1 m-2). The maximum dry matter recorded in unweeded control treatment (3.87 and 5 g m-2). Among herbicide combinations, Pendimethalin 30 EC @ 1 kg ha^{-1} as PE + one manual weeding proved to be the most successful treatment for reducing the dry matter of sedges at 30 and 60 DAS.

Dry matter production (g plant^{-1})

The data for dry matter production plant^{-1} taken at 30 and 60 DAS are shown in Table and depicted in at 30 DAS, there were significant variations in dry matter production plant^{-1}. Two hand weeding treatment recorded highest dry matter accumulation (5.05) which was at par with the treatment of Pendimethalin 30 EC @ 1 kg ha^{-1} as PE + one hand weeding (4.56) and Pendimethalin 30 EC @ 1kg ha^{-1} as PE + Imazethapyr 10 SL @ 100ml ha^{-1} as PoE (4.09) and significant over rest of the treatments. The unweeded control treatment (2.30) had the significantly lowest dry matter accumulation per plant^{-1}.At 60 DAS two hand weeding recorded maximum dry matter accumulation plant^{-1} (15.21) than all other treatment which was at par with Pendimethalin 30 EC @ 1 kg ha^{-1} asPE + one hand weeding (14.58) and Pendimethalin 30 EC @ 1kg ha^{-1} as PE + Imazethapyr 10 SL @ 100ml ha^{-1} as PoE (14.13) and significantly greater than rest of the treatments. The significantly lowest dry matter accumulation plant^{-1} recorded in unweeded control treatment (10.34).

Table 1: Effect of Integrated Nutrient Management on density and dry matter of grassy weeds

Treatments	Density of grasses (no. m-2)		Density of weeds (no. m^{-2})		Dry matter of weeds (g m-2)		Density of grasses (no. m-2)		Dry matter of grasses (g m-2)		Density of grasses (no. m-2)		Dry matter of grasses (g m-2)	
	30 DAS	60 DAS	30 DAS	60 DAS	30 DAS	60 DAS	30 DAS	60 DAS	30 DAS	60 DAS	30 DAS	60 DAS	30 DAS	60 DAS
Control	8.9	10.84	13.89	17.81	8.6	10.68	8.9	10.84	5.61	7.37	5.35	7.55	3.87	5
	- 78.71	- 117.01	- 192.57	-299.8	- 73.47	- 113.58	- 78.71	- 117.01	- 30.97	- 53.82	- 28.12	-56.5	- 14.48	-24.5
Two hand weeding at 20 & 40 DAS	3.7	4	6.14	6.34	3.56	3.48	3.7	4	2.21	2.33	2.56	2.84	1.81	1.7
	- 13.19	-15.5	-37.24	-34.2	- 12.18	-11.62	- 13.19	-15.5	-4.38	-4.93	-6.05	-7.57	-2.78	-2.39
Pendimethalin 30 EC @ 1kg ha^{-1} as PE	5.3	8.65	8.78	12.04	5.41	8	5.3	8.65	3.59	5.37	3.28	4.19	2.55	4.3
	- 27.59	-74.32	-76.55	- 133.39	- 28.78	-63.47	- 27.59	-74.32	- 12.39	- 28.84	- 10.26	- 17.06	-6	- 17.99
Pendimethalin 30 EC @ 1 kg ha^{-1} as PE + one hand weeding at 20 DAS	3.9	4.9	6.27	7.41	3.72	4.53	3.9	4.9	2.29	3.2	2.79	2.86	1.83	2
	- 14.71	-23.51	-38.93	-52.03	- 13.34	-20.03	- 14.71	-23.51	-4.74	-9.74	-7.28	-7.68	-2.85	-3.5
Quizalofopethyl 5 EC @ 50g ha-1 at 20 DAS as PoE	5.73	7.23	8.99	10.66	5.54	6.48	5.73	7.23	3.72	4.68	4.64	4.45	2.9	3
	- 32.33	-51.77	-80.42	-103.4	- 30.17	-41.51	- 32.33	-51.77	- 13.34	-21.4	- 21.03	-19.3	-7.91	-8.5
Imazethapyr 10 SL @ 100ml ha- 1 at 20 DAS as PoE	5.5	6.7	8.58	9.95	5.36	5.77	5.5	6.7	3.61	3.9	4.19	3.91	2.53	2.67
	- 29.75	-44.39	-73.25	-89.48	- 28.23	-32.83	- 29.75	-44.39	- 12.53	- 14.71	- 17.06	- 14.79	-5.9	-6.63
Pendimethalin 30 EC @ 1kg ha^{-1} as PE + Quizalofopethyl 5 EC @ 50g ha-	4.8	5.5	7.82	8.63	4.36	5.19	4.8	5.5	2.68	3.62	3.8	3.68	2.15	2.5
	- 22.54	-29.75	-60.8	-66.2	- 18.48	-26.43	- 22.54	-29.75	-6.68	-12.6	- 13.94	- 13.04	-4.12	-5.75
1 at 20 DAS as PoE														
Pendimethalin 30 EC @ 1kg ha^{-1} as PE + Imazethapyr 10 SL @ 100ml ha- 1 at 20 DAS as PoE	4.4	5.26	7.16	8.14	4.08	4.75	4.4	5.26	2.42	3.29	3.45	3.12	2.01	2.1
	- 18.86	-27.17	-50.86	-58.37	- 15.96	-22.08	- 18.86	-27.17	-5.36	- 10.32	-11.4	-9.23	-3.54	-3.91
SE(m±)	0.58	0.51	0.76	0.54	0.399	0.4	0.58	0.51	0.52	0.86	0.51	0.78	0.39	0.62
C.D (0.05)	1.78	1.58	2.33	1.65	1.22	1.23	1.78	1.58	1.61	2.64	1.57	2.41	1.21	1.91

References

1. Ahirwar RP, Mishra US, Mitra NG, Sirothia P. Effect of phosphorus and bio-fertilizers on phosphorus use efficiency, biological N-fixation and yield of pigeonpea (*Cajanus cajan* L.). Int J Agric Environ Biotechnol (IJAEB). 2016;9(6):1039-43.
2. Ali M, Kumar S, Singh BB. Pulses in India: Retrospect and prospects. Kanpur: Indian Institute of Pulses Research; 2011.
3. Amit K, Pareek BL, Yadav RS. Response of green gram (*Vigna radiata*) to bio-fertilizer under different fertility levels. Indian J Agric Sci. 2019;80(7):655.
4. Anonymous. Directorate of Economics and Statistics, Statistics Division; 2024.
5. Bahadur L, Tiwari DD. Nutrient management in mungbean (*Vigna radiata* L.) through sulphur and bio-fertilizers. Legume Res. 2014;37(2):180-7.
6. Chaudhari PR, Shinde RR, Bansod VD. Integrated weed management in summer green gram. Legume Res. 2016;39(2):206-10.
7. Choudhary GL, Yadav LR. Effect of fertility levels and foliar nutrition on cowpea productivity. J Food Legumes. 2011;24:67-8.
8. Ghanshyam, Kumar R, Jat RK. Productivity and soil fertility as affected by organic manures and inorganic fertilizers in greengram (*Vigna radiata* L.) - wheat (*Triticum aestivum* L.) system. Indian J Agron. 2010;55(1):16-21.
9. Government of India (GOI). Agricultural Statistics at a Glance. Directorate of Economics and Statistics, Ministry of Agriculture and Farmers' Welfare; 2021-22.
10. Gupta A, Sharma VK, Sharma GD, Chopra P. Effect of biofertilizers and phosphorus levels on yield attributes, yield and quality of urdbean (*Vigna mungo*). Indian J Agron.

2016;51(2):142-4.
11. Khan KS, Joergensen RG. Changes in microbial biomass and phosphorus fractions in biogenic household waste compost amended with inorganic phosphatic fertilizers. Bioresour Technol. 2019;100:303-9.
12. Kumari S, Yadav BL, Verma HP, Meena JS, Pancholi P. Effect of bio-fertilizer and phosphorus on physical properties of soil, yield attributes and yield of mungbean. Ann Agric Res. 2015;36:394-9.
13. Mohammad I, Yadav BL, Ahmad A. Effect of phosphorus and bio-organics on yield and soil fertility status of mungbean (*Vigna radiata* L. Wilczek) under semiarid condition of Rajasthan, India. Int J Curr Microbiol Appl Sci. 2017;6(3):1545-53.
14. Singh RP. Weed management in pulses. Indian J Agron. 1993;38(3):427-34.
15. Singh V, Rana SS, Kumar V. Weed management in pulses: Challenges and opportunities. Indian J Weed Sci. 2015;47(3):239-48.
16. USDA. National Nutrient Database for Standard Reference. U.S. Department of Agriculture; 2020.