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Response of mungbean (*Vigna radiata* L.) to weed control practices in Rajasthan

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Abstract
An investigation "Response of Mungbean (*Vigna radiata* L.) to Weed Control Practices in Rajasthan" was carried out during the *kharif* season of 2024 at the Research Farm, Suresh Gyan Vihar University, Jaipur, on loamy sand soil. The experiment finding recorded that application of pendimethalin 0.75 kg/ha PE fb Imazethapyr 40 g/ha 20 DAS significantly lowest the density and dry matter of weeds at 30 DAS and harvest. Whereas maximum weed control efficiency was recorded with pendimethalin 0.75 kg/ha PE fb Imazethapyr 40 g/ha 20 DAS. Pendimethalin 0.75 kg/ha PE fb Imazethapyr 40 g/ha 20 DAS was significantly enhanced the number of pods per plant, number of seeds per pods, seed, straw and biological yield of green gram as compared to weedy check, Propaquizafop + imazethapyr PoE @ 100 g a.i./ha, Clodinafop-propargyl + sodium-acifluorfen PoE @ 187.5 g a.i./ha, Imazethapyr 40 g/ha 20 DAS and remained statistically at par with weed free.

Keywords: Imazethapyr, pendimethalin, pod, seed and yield

Introduction
Pulses, also known as grain legumes, rank second only to cereals in global agricultural importance. They are widely recognized as an ideal choice for agricultural diversification and intensification due to their inherent advantages, including biological nitrogen fixation (15-35 kg/ha), high protein content, and adaptability to marginal environments. Among these, mung bean stands out as a protein (24.5%), with a high lysine content (460 mg/g) and a notable level of tryptophan (60 mg/g) (Kumar and Pandey, 2018) [6].

In India, mungbean is grown on 5.13 million hectares area with total production of 3.31 million tonnes and an average productivity of 570 kg ha^{-1} (Anonymous, 2023-24). Rajasthan occupied first position in total mungbean production of India, which produces 1.6 million tonnes from 2.62 million hectares with an average productivity of 545 $kgha^{-1}$ (Anonymous, 2023-24).

Weeds have competitive nature and withstand in adverse condition and it create to main crop for water, nutrient, space and light so significant reduction the yield. Naturally more resilient and competitive than most crops, weeds can cause severe losses if not effectively managed. According to Rao (2000), weeds account for the highest proportion of total annual agricultural production losses around 45 percent followed by insect and pest (30%), diseases (20%), and other factors (5%). Effective weed management is particularly important in mung bean (green gram) cultivation. During the early growth stages, the crop grows slowly, allowing weeds to establish rapidly and compete for vital resources. This competition can result in yield losses ranging from 30% to 50% (Kumar *et al*., 2004) [7]. As noted by Suresh *et al*. (2016) [8], managing weeds during this critical period is essential for improving productivity and ensuring the successful cultivation of green gram.

Methods and Materials
The field investigation was carried out during the *kharif* season of 2024 at the Research Farm, School of Agriculture, Suresh Gyan Vihar University, Jaipur. Geographically, the study site is located at 75°48'84" E longitude and 26°82'47" N latitude, falling under Agro-Climatic Zone III A (Semi-Arid Eastern Plain Zone) of Rajasthan. The experiment consisting eight treatments (Weedy check, Weed free, Pendimethalin 0.75 kg/ha PE, Imazethapyr 40

g/ha 20 DAS, Imazethapyr + imazamox 60 g/ha 20 DAS, Pendimethalin 0.75 kg/ha PE fb Imazethapyr 40 g/ha 20 DAS, Propaquizafop + imazethapyr PoE @ 100 g a.i./ha and Clodinafop-propargyl + sodium-acifluorfen PoE @ 187.5 g a.i./ha). The total eight treatment combinations were tested in randomized block design with three replications.

Results and Discussion

Weed control methods had a significant effect on density and dry matter accumulation of weeds in green gram. Application of pendimethalin 0.75 kg/ha PE fb Imazethapyr 40 g/ha 20 DAS and pendimethalin 0.75 kg/ha PE was significantly reduced the density and dry matter of weed at 30 DAS and harvest as compared to all applied weed control measures. Its might be due to pendimethalin significant impact of germinating stages of weeds because its applied as pre-emergence and its absorbed by germinating seedling and inhibit the cell division and elongation of root and shoot. Imazethapyr acts as a ALS inhibitor, further suppress the cell division and carbohydrate translocation to the plant parts (Jinger *et al*., 2016) [2, 5].

Highest weed control efficiency (71.21%) was found with Pendimethalin 0.75 kg/ha PE *fb* Imazethapyr 40 g/ha 20 DAS followed by Clodinafop-propargyl + sodium-acifluorfen PoE @ 187.5 g a.i./ha (57.40%), Imazethapyr + imazamox 60 g/ha 20 DAS (54.39%), Imazethapyr 40 g/ha 20 DAS (51.95%), Propaquizafop + imazethapyr PoE @ 100 g a.i./ha (51.15%) and pendimethalin 0.75 kg/ha PE (35.17%). Its might be due to application of Pendimethalin 0.75 kg/ha PE *fb* Imazethapyr 40 g/ha 20 DAS significantly reduced the weed density and dry matter throughout the growth period of crop because its control the weeds from germination by pendimethalin and followed by Imazathapyr at vegetative stage so weeds can't not attain proper density and as well as dry matter Similar experimental finding also reported on green gram by Jinger *et al*. (2016) [2, 5].

The highest number of pods per plant (30.33) and seeds per pod (8.11) were recorded under the treatment Pendimethalin 0.75 kg/ha (PE) followed by Imazethapyr 40 g/ha at 20 DAS, which was statistically at par with the weed-free treatment (32.33 pods/plant and 8.67 seeds/pod). Other effective treatments included pendimethalin alone (25.33 pods/plant) and Imazethapyr alone (24.33 pods/plant). Although green gram has the potential for high pod and seed counts, severe weed competition during critical growth stages can significantly reduce these parameters due to intense competition for light, water, and nutrients. Similar findings were reported by Raj *et al*. (2012) [9].

The same treatment pendimethalin fb Imazethapyr also recorded the highest seed yield, straw yield, and biological yield, which was statistically comparable to the weed-free control. Other weed management treatments, including Pendimethalin alone, Imazethapyr alone, Imazethapyr + Imazamox, Clodinafop-propargyl + Sodium-acifluorfen, and Propaquizafop + Imazethapyr, also produced significantly higher yields than the untreated control and were statistically at par with one another. These increases in yield can be attributed to effective weed suppression, resulting in reduced competition for growth resources. Singh *et al*. (2006) [3] and Yadav *et al*. (2014) [4].

Table 1: Effect of weed management on density and dry matter on weeds

Treatments	Weed density (No/m^2)		Dry matter of weeds (No/m^2)		WCE (%)
	30 DAS	At harvest	30 DAS	At harvest	
Weedy Check	4.56 (20.33)	5.27 (27.33)	10.03	138.33	0.00
Weed free	0.71 (0.0)	0.71 (0.00)	0.00	0.00	100.00
Pendimethalin 0.75 kg/ha PE	3.24(10.00)	3.89 (14.67)	4.00	88.67	35.17
Imazethapyr 40 g/ha 20 DAS	4.02 (15.67)	3.23 (10.00)	6.00	65.67	51.95
Imazethapyr + imazamox 60 g/ha 20 DAS	3.72 (13.33)	3.18 (9.67)	5.67	63.00	54.39
Pendimethalin 0.75 kg/ha PE fb Imazethapyr 40 g/ha 20 DAS	2.34 (5.00)	2.63 (6.44)	3.50	39.33	71.21
Propaquizafop + imazethapyr PoE @ 100 g a.i./ha	3.76 (13.67)	3.29 (10.33)	5.83	66.67	51.15
Clodinafop-propargyl + sodium-acifluorfen PoE @ 187.5 g a.i./ha	3.62(12.67)	3.13 (9.33)	5.43	58.33	57.40
SEm±	0.12	0.10	0.68	4.33	-
CD (p=0.05%)	0.37	0.31	2.06	13.12	-

Table 2: Effect of weed management on yield attributes and yields

Treatments	Pods/plant	Seeds/pod	Yields (kg/ha)		
			Seed	Straw	Biological
\Weedy Check	14.33	4.67	617	1467	2083
Weed free	32.33	8.67	1030	2662	3692
Pendimethalin 0.75 kg/ha PE	25.33	7.00	830	2200	3030
Imazethapyr 40 g/ha 20 DAS	24.33	6.67	793	2037	2830
Imazethapyr + imazamox 60 g/ha 20 DAS	26.33	7.00	837	2107	2944
Pendimethalin 0.75 kg/ha PE fb Imazethapyr 40 g/ha 20 DAS	30.33	8.11	960	2503	3463
Propaquizafop + imazethapyr PoE @ 100 g a.i./ha	23.00	6.67	790	2012	2802
Clodinafop-propargyl + sodium-acifluorfen PoE @ 187.5 g a.i./ha	20.67	6.33	800	2074	2874
SEm±	1.98	0.27	18	78	94
CD (p=0.05%)	6.00	0.82	58	236	287

Conclusion

The present investigation revealed that weed control practices significantly influenced weed density, dry matter accumulation, and productivity of green gram. The treatment with pendimethalin 0.75 kg/ha PE followed by imazethapyr 40 g/ha at 20 DAS was most effective, recording the lowest weed density, maximum weed control efficiency, and higher yield attributes such as pods per plant and seeds per pod. This treatment also resulted in the highest seed yield, straw yield, and biological yield, which were statistically at par with the weed-free condition. The superior performance of this treatment could be attributed to

sequential suppression of weeds during germination and vegetative stages, ensuring better crop growth and resource utilization. Other herbicidal treatments like pendimethalin alone, imazethapyr alone, and their combinations also improved yield significantly compared to weedy check. Thus, sequential application of pendimethalin and imazethapyr can be recommended as an efficient weed management practice in green gram for higher productivity

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