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Effect of different weed management practices on weeds dynamics, growth and productivity of cowpea (*Vigna unguiculata* L.)

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Abstract
A field experiment was conducted at the Instructional Farm of Agronomy, Rajasthan College of Agriculture, Udaipur during *kharif*, 2024 to study the "Effect of Different Weed Management Practices on Weeds Dynamics, Growth and Productivity of Cowpea (*Vigna unguiculata* L.)". The experiment was laid out in randomized block design comprising of 12 treatment combinations with three number of replications. Results of this experiment revealed that all weed observations *i.e.*, weed density, weed dry matter accumulation, WCE recorded lowest under W_2 [Two hand weeding at 15 and 30 DAS] but in yield attributes and yield (grain, stover and biological) were maximum under W_{12} (weed free). Additionally, W_{11} [Pendimethalin @ 0.5 kg ha^{-1} (PE) + Imazethapyr @ 0.075 kg ha^{-1} 20 DAS (PoE)] recorded significantly highest nutrient content and uptake by grain as well as stover yield among herbicidal treatments. However, lowest growth, yield attributes and yield were observed under weedy check (W_1).

Keywords: cowpea, WCE, pendimethalin, imazethapyr, yield

Introduction
Cowpea (*Vigna unguiculata* L.) plays an important role in the livelihood of millions of people in developing countries. This versatile crop belongs to C_3 family which is broadly used for human food, animal feed, fodder as well as industrial purposes and also it can be used as green manure and cover crops. As it is an efficient pulse crop, it has the ability to fix high nitrogen thus enhancing soil fertility (Abayomi and Abidoye, 2009) [1]. It is a widely grown summer and *kharif* season crop and its drought tolerance, smothering nature and soil-restoring qualities have brought it widespread recognition. Due to presence of high protein content, other nutrients and minerals like calcium and iron, it is also referred to as "Vegetable meat". On dry weight basis, cowpea seeds contain 23.4 per cent protein, 1.8 per cent fat, 60.3 per cent carbohydrate, 3.4 per cent fibre, 3.3 per cent ash and 9-11 per cent moisture. The world's estimated annual cowpea production is put at 8.99 million metric tons from an estimated land area of 14.91 million hectares (FAOSTAT, 2021) [2].

The crop loses greatly during the rainy season as a result of weed invasion, which lowers crop production significantly. Due to adequate moisture and other suitable environmental factors, which provides congenial environment for luxurious weed growth. Cowpea crop is sensitive to weed infestation in early stages of growth. Therefore, it is necessary to control weeds during the early stages of crop growth. Weed management practices plays vital role in increasing the productivity of crop specially in rainy season. The most widely used herbicide for cowpea weed management is pendimethalin, which can be used either by itself or in combination with hand weeding. Pre-emergence applications alone are not sufficient to curtail repeated flushes of weeds during rainy season, which highly necessitates a post-emergence application following pre-emergence one.

Materials and Methods
The experiment was carried out at the Instructional Farm of Agronomy, Rajasthan College of

Agriculture, Udaipur (24° 35'N latitude, 73° 42'E longitude and an altitude of 581.13 metre above mean sea level) during *kharif*, 2024. The soil of the experimental field was clay- loam in texture, moderately alkaline in reaction with low level of available nitrogen, medium level of available phosphorus and high level of available potassium. The experiment was laid out in randomized block design comprising of 12 treatment combinations replicated thrice. The treatments were weedy check (W1), Two hand weeding at 15 & 30 DAS (W2), Pendimethalin @ 0.5 kg ha^{-1} (PE) (W3), Metribuzin @ 0.35 kg ha^{-1} (PE) (W4), Imazethapyr @ 0.075 kg ha^{-1} 20 DAS (PoE) (W5), Quizalofop Ethyl @ 0.04 kg ha^{-1} 20 DAS (PoE) (W6), Pendimethalin @ 0.5 kg ha^{-1} (PE) + One hand weeding at 20 DAS (W7), Metribuzin @ 0.35 kg ha^{-1} (PE) + Quizalofop Ethyl @ 0.04 kg ha^{-1} 20 DAS (PoE) (W8), Pendimethalin @ 0.5 kg ha^{-1} (PE) + Quizalofop Ethyl @ 0.04 kg ha^{-1} 20 DAS (PoE) (W9), Metribuzin @ 0.35 kg ha^{-1} (PE) + Imazethapyr @ 0.075 kg ha^{-1} 20 DAS (PoE) (W10), (Pendimethalin @ 0.5 kg ha^{-1} (PE) + Imazethapyr @ 0.075 kg ha^{-1} 20 DAS (PoE) (W11) and weed free (W12). RC-19 variety were used with 30 cm × 10 cm geometry.

Weed dry matter accumulation was measured by removing weeds from 0.5 m^2 area inside the quadrate at harvest. The weeds were classified as grassy, sedges and broad-leaved. The samples then sun dried for 24 hours followed by oven drying at 65^{o}C till a constant weight was observed to obtain weed dry matter and was expressed in kg ha^{-1}. Total weed dry matter was also calculated by adding total grassy, sedges and broad-leaved weeds. In case of WCE, that was calculated using following formula suggested by Mani *et al.* (1973) [6]. It was expressed in per cent.

$$WCE = \frac{\text{Dry weight of weeds in unweeded control plots } gm^{-2} - \text{Dry weight of weeds in treated plots } gm^{-2}}{\text{Dry weight of weeds in unweeded control plots } gm^{-2}} \times 100$$

For counting seed yield, that was done after threshing and winnowing from net plot and calculated seed yield in terms of kg ha^{-1}.

Results and Discussion

Weed Studies

Weed Dry Matter Accumulation

All the weed management treatments significantly decreased weed dry matter at harvest. The maximum reduction in weed dry matter was observed in weed free treatment followed by two hand weeding at 15 and 30 DAS. At 60 DAS and at harvest it followed the same results due to complete suppression of dry matter in all weed groups (grasses, sedges and broad-leaved weeds) indicating their high efficacy in early-season weed control. Among herbicidal combinations, W_{11} [Pendimethalin @ 0.5 kg ha^{-1} (PE) + Imazethapyr @ 0.075 kg ha^{-1} (PoE)] recorded the lowest dry matter accumulation in all three weed groups combinations and proved significantly superior to weedy check. This might be attributed to the complementary action of pre-emergence and post-emergence herbicides that effectively suppressed both monocot and dicot weed species in the initial growth phase of the crop. These results are in close proximity with the findings of Nagender *et al.* (2017) [8] and Teli *et al.* (2020) [9].

Weed Control Efficiency (WCE)

The data presented in Table 1 revealed that weed management practices show a significant influence of on weed control efficiency at 30, 60 DAS and at harvest. At harvest, the maximum weed control efficiency was observed under weed free (100%) and W_2 [Two hand weeding at 15 and 30 DAS], which were statistically superior over all other treatments. This was expected due to the complete absence of weed flora at the early growth stage through timely manual interventions. However, among herbicidal treatments, W_{11} [Pendimethalin @ 0.5 kg ha^{-1} (PE) + Imazethapyr @ 0.075 kg ha^{-1} 20 DAS (PoE)] recorded highest weed control efficiency at all stages significantly outperforming the sole application of Pendimethalin and Imazethapyr, respectively. The synergistic action of pre-emergence Pendimethalin, which controls germinating weed seeds and post-emergence Imazethapyr which ensured broad-spectrum and extended control.

Timely weed control prevents yield losses by minimizing competition during critical growth stages, especially in sensitive crops like cowpea. Similar results are found under study by Jinger *et al.* (2016) [3] and Kumar *et al.* (2016) [4].

Crop Studies

Seed Yield

Data presented in Table 2 indicate that the maximum seed yield (1333 kg ha^{-1}), haulm yield (2840 kg ha^{-1}) and biological yield (4173 kg ha^{-1}) was obtained under weed free followed by W_{11} [Pendimethalin @ 0.5 kg ha^{-1}(PE) + Imazethapyr @ 0.075 kg ha^{-1} at 20 DAS (PoE)] and harvest index was higher in W_{11}, which was due to prolonged and effective weed control, which reduced competition for vital growth resources such as light, nutrients, water and space. This enabled the crop to grow more vigorously, accumulate greater dry matter and support better flowering, pod formation and grain filling. Effective weed suppression also improved nutrient uptake, especially of nitrogen and phosphorus, which play a pivotal role in reproductive development and seed formation. The results are in close proximity with the findings of Muthuram *et al.* (2018) [7] and Mohanty *et al.* (2023) [6].

Table 1: Effect of different weed management practices on weed control efficiency and weed dry matter accumulation of cowpea

S. No.	Treatments	Weed control efficiency (%)			Weed dry matter accumulation (kg ha^{-1})
		30 DAS	60 DAS	At harvest	
W_1	Weedy check	0.00	0.00	0.00	49.29
W_2	Two hand weeding at 15 and 30 DAS	100.00	82.79	82.85	12.28
W_3	Pendimethalin @ 0.5 kg ha^{-1} (PE)	38.51	49.06	53.06	28.31
W_4	Metribuzin @ 0.35 kg ha^{-1} (PE)	27.14	34.43	42.67	33.10
W_5	Imazethapyr @ 0.075 kg ha^{-1} 20 DAS (PoE)	66.03	71.06.	70.44	25.54
W_6	Quizalofop Ethyl @ 0.04 kg ha^{-1} 20 DAS (PoE)	48.83	49.59	54.12	30.55
W_7	Pendimethalin @ 0.5 kg ha^{-1} (PE) + One hand weeding at 20 DAS	88.55	81.37	78.75	17.06

W_8	Metribuzin @ 0.35 kg ha^{-1} (PE) + Quizalofop Ethyl @ 0.04 kg ha^{-1} 20 DAS (PoE)	47.31	54.65	57.04	23.98
W_9	Pendimethalin @ 0.5 kg ha^{-1} (PE) + Quizalofop Ethyl @ 0.04 kg ha^{-1} 20 DAS (PoE)	54.53	61.04	61.37	22.08.
W_{10}	Metribuzin @ 0.35 kg ha^{-1} (PE) + Imazethapyr @ 0.075 kg ha^{-1} 20 DAS (PoE)	66.51	72.12	69.89	19.74.
W_{11}	Pendimethalin @ 0.5 kg ha^{-1} (PE) + Imazethapyr @ 0.075 kg ha^{-1} 20 DAS (PoE)	76.54	75.57	76.45	17.64
W_{12}	Weed free	100.00	100.00	100.00	0.00
	S.Em±	2.17	1.75	1.13	2.12
	CD (P=0.05)	6.36	5.14	3.32	6.20

Table 2: Effect of different weed management practices on yield of cowpea

S. No.	Treatments	Yield (kg ha^{-1})		
		Seed	Haulm	Biological
W_1	Weedy check	719	1902	2622
W_2	Two hand weeding at 15 and 30 DAS	1244	2590	3834
W_3	Pendimethalin @ 0.5 kg ha^{-1} (PE)	1016	2172	3189
W_4	Metribuzin @ 0.35 kg ha^{-1} (PE)	948	2016	2965
W_5	Imazethapyr @ 0.075 kg ha^{-1} 20 DAS (PoE)	1056	2226	3282
W_6	Quizalofop Ethyl @ 0.04 kg ha^{-1} 20 DAS (PoE)	984	2042	3026
W_7	Pendimethalin @ 0.5 kg ha^{-1} (PE) + One hand weeding at 20 DAS	1176	2480	3656
W_8	Metribuzin @ 0.35 kg ha^{-1} (PE) + Quizalofop Ethyl @ 0.04 kg ha^{-1} 20 DAS (PoE)	1078	2233	3310
W_9	Pendimethalin @ 0.5 kg ha^{-1} (PE) + Quizalofop Ethyl @ 0.04 kg ha^{-1} 20 DAS (PoE)	1104	2251	3355
W_{10}	Metribuzin @ 0.35 kg ha^{-1} (PE) + Imazethapyr @ 0.075 kg ha^{-1} 20 DAS (PoE)	1139	2307	3446
W_{11}	Pendimethalin @ 0.5 kg ha^{-1} (PE) + Imazethapyr @ 0.075 kg ha^{-1} 20 DAS (PoE)	1205	2414	3619
W_{12}	Weed free	1333	2840	4173
	S.Em±	29.61	92.60	99.16
	CD (P=0.05)	86.85	271.57	290.83

Conclusion

On the basis of the experiment, it was observed that treatment weed free (W_{12}) up to harvest gave maximum seed yield (1333 kg ha^{-1}) and haulm yield (2840 kg ha^{-1}). However, among various herbicide treatments W_{11} [Pendimethalin @ 0.5 kg ha^{-1} (PE) + Imazethapyr @ 0.075 kg ha^{-1} 20 DAS (PoE)] recorded maximum weed control efficiency (76.45%) at harvest, minimum weed index (17.64%), seed yield (1205 kg ha^{-1}) and haulm yield (2414 kg ha^{-1}) with net return (₹ 52,307 ha^{-1}) and B-C ratio (1.73) which was highest over rest of the weed control treatments.

References

1. Abayomi YA, Abidoye TO. Evaluation of cowpea genotypes for soil moisture stress tolerance under screen house conditions. Afr J Plant Sci. 2009;3(10):229-237.
2. FAOSTAT. Crops and livestock products. 2021. Available from: https://www.fao.org/faostat/en/data/QCI/
3. Jinger D, Yadav RS, Meena SS. Effect of weed management practices on weed growth and yield of cowpea (*Vigna unguiculata* (L.) Walp.). Legume Res. 2016;39(3):445-449.
4. Kumar R, Malik YP, Punia SS. Weed control in fenugreek with pendimethalin and imazethapyr. Indian J Weed Sci. 2016;48(2):225-227.
5. Mani VS, Pandita MS, Gautam KC, Das B. Weed killing chemicals in wheat cultivation. PANS. 1973;23:17-18.
6. Mohanty P, Sar K, Duary B, Mishra G. Effect of sole and ready-mix herbicides on weeds and productivity of summer greengram in Odisha. Indian J Weed Sci. 2023;55(1):50-53.
7. Muthuram T, Krishnan R, Baradhan G. Productivity enhancement of irrigated greengram (*Vigna radiata* L.) through integrated weed management. Plant Arch. 2018;18(1):101-105.
8. Nagender T, Srinivas A, Rani PL, Narender J. Evaluation of efficacy of different pre- and post-emergence herbicides for efficient weed control in greengram (*Vigna radiata* L.). Environ Ecol. 2017;35(1B):595-600.
9. Teli KG, Mundra SL, Sharma NK, Kumar A. Effect of weed management and phosphorus nutrition on yield of cowpea (*Vigna unguiculata* (L.) Walp.). J Pharmacogn Phytochem. 2020;9(2):1165-1167.