



P-ISSN: 2349-8528

E-ISSN: 2321-4902

www.chemijournal.com

IJCS 2020; 8(4): 3430-3432

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Received: 12-05-2020

Accepted: 14-06-2020

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Effect of weed management on growth and yield of mungbean [*Vigna radiata* (L.) Wilczek]

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DOI: <https://doi.org/10.22271/chemi.2020.v8.i4aq.10184>

Abstract

A field experiment entitled “Efficacy of herbicides on growth and yield of mungbean [*Vigna radiata* (L.) Wilczek]” was conducted at Agronomy Farm of Agricultural Research Station, Mandor, Jodhpur during *kharif* season, 2018. The experiment comprised of twelve weed control treatments that were laid out in randomized block design and replicated thrice. Results indicated that among herbicidal treatments, lowest weed density (No. m⁻²), dry matter (g m⁻²) recorded under the application of pendimethalin + imazethapyr (ready mix) 900 g ha⁻¹ as PE and it was at par with its ready mix at 800 g ha⁻¹. Application of imazethapyr 90 g ha⁻¹ (PoE) and pendimethalin 750 g (PE) also observed significantly lower weed density and weed dry matter of weeds at 30 and 60 DAS compared to weedy check. Results further indicated that, weed free recorded highest seed yield and it was found at par with pendimethalin + imazethapyr (ready mix) 900 g ha⁻¹ as PE followed by pendimethalin + imazethapyr (ready mix) 800 g ha⁻¹.

Keywords: Mungbean, herbicide, weed density, weed dry matter, yield

Introduction

Mungbean (*Vigna radiata* L. Wilczek) commonly known as “Green gram” is one of the most important and extensively cultivated pulse crops in arid and semi-arid regions of India. It is a self-pollinated annual crop belongs to family Leguminosae. Mungbean occupies prime position amongst pulses by virtue of its short growth period, huge tonnage capacity and outstanding nutrient value as food, feed, and forage. Every 100 g of edible portion of mungbean grain contains 75 mg calcium, 4.5 mg phosphorus, 24.5 g protein and 348 kilo calories energy (Meena *et al.*, 2013) [3]. Amongst the pulses, mungbean covers an area of 4.25 million hectares and contributing 2.41 million tonnes of production with productivity of 567 kg ha⁻¹ in the country (Project Coordinator’s Report, 2019). The important mungbean growing states are Rajasthan, Uttar Pradesh, Odisha, Maharashtra, Madhya Pradesh., Karnataka, Tamilnadu and Bihar. In Rajasthan, total area under *kharif* mungbean crop is 1.92 million hectares with the production of 1.24 million tonnes and productivity of 650 kg ha⁻¹ (Project Coordinator’s Report, 2019).

Amongst various barriers of its poor productivity like lack of high-yielding with synchronized maturity, drought and disease resistant varieties to the farmers, weed management is one of the pivotal aspects of the crop production particularly in *kharif* pulses. Weeds cause severe losses in mungbean due to its short stature and may causes losses up to 40-68 per cent (Tamang *et al.*, 2015) [7]. Mehriya and Shukla (2015) [4] also observed that weed causes 23.5-45.8 per cent decline in grain yield due to competition for space, nutrient, water and light at Mandor (Jodhpur). As far as concerning with the shortage of labour and increased cost of manual weeding during peak period of crop, the manual weeding is not economical. The herbicide application is feasible and attracts attention for weed management in this condition. The available pre and early post emergence herbicides viz., pendimethalin, oxyfluorfen, imazethapyr alone and their ready mix are able to check the emergence and growth of weeds at initial crop growth of mungbean in *kharif* season.

Material and Methods

A field experiment entitled "Efficacy of herbicides on growth and yield of mungbean [*Vigna radiata* (L.) Wilczek]" was conducted at Agronomy Farm of Agricultural Research Station, Mandor, Jodhpur during *khariif* season, 2018. The analytical results indicate that soil of the experimental field is sandy loam in texture, slightly alkaline in reaction (pH 8.3), low in organic carbon (0.14%) and available nitrogen (176 kg ha⁻¹), whereas medium in phosphorus (21.6 kg P₂O₅ ha⁻¹) and available potassium (318 kg K₂O ha⁻¹). The experiment comprised of twelve weed control treatments viz. Weedy check-W₁, Weed free-W₂, Oxyfluorfen 50 g ha⁻¹ (PoE)-W₃, Oxyfluorfen 70 g ha⁻¹ (PoE)-W₄, Imazethapyr 60 g ha⁻¹ (PoE)-W₅, Imazethapyr 90 g ha⁻¹ (PoE)-W₆, Pendimethalin 750 g ha⁻¹ (PE)-W₇, Pendimethalin + Oxyfluorfen 400 g ha⁻¹ (PE)-W₈, Pendimethalin + Oxyfluorfen 550 g ha⁻¹ (PE)-W₉, Pendimethalin + Oxyfluorfen 750 g ha⁻¹ (PE)-W₁₀, Pendimethalin + Imazethapyr 800 g ha⁻¹ (PE)-W₁₁ and Pendimethalin + Imazethapyr 900 g ha⁻¹ (PE)-W₁₂ that were laid out in randomized block design and replicated thrice. A basal dose of 12 kg N and 30 kg P₂O₅ ha⁻¹ was drilled uniformly before sowing through diammonium phosphate in individual plot at the depth of 7 to 8 cm below the seed. These herbicides were sprayed with knapsack sprayer using flat fan nozzle using 600 liters of water hectare⁻¹. In each plot were counted from two randomly selected area of 0.25 m² using 0.5 m x 0.5 m quadrat at 30 and 60 DAS and at harvest. Weed count was expressed as number m⁻². The mean data were subjected to square root transformation $\sqrt{(x+0.5)}$ to normalize their distribution (Gomez and Gomez, 1984). The dry matter was then computed in terms of g m⁻².

Result and Discussion

Effect on crop

Herbicidal weed management practices had no significant effect on initial plant stand of mungbean and the final minimum and maximum plant stand was observed under weedy check and weed free, respectively. Among herbicidal

treatments, the maximum plant population recorded under the application of pendimethalin + imazethapyr (ready mix) 900 g ha⁻¹ as PE (Table 1). The minimum plant height was observed under weedy check at 30 and 60 DAS. The data reveal that the tallest plants were produced under weed free treatment which was significantly taller over rest of treatments. Amongst the herbicidal treatment, the maximum plant height recorded under the application of pendimethalin + imazethapyr (ready mix) 900 g ha⁻¹ as PE and it was at par with its ready mix at 800 g ha⁻¹ (Verma *et al.*, 2017) [8].

Further insight of data explicates that collective application of herbicides either as alone or ready mix resulted in significantly maximum seed yield of mungbean compared to weedy check (Table 1). Pre emergence application of pendimethalin + imazethapyr (ready mix) 900 g ha⁻¹ registered significantly maximum seed yield then other herbicidal weed control treatments. However, it was found at par with PE pendimethalin + imazethapyr (ready mix) 800 g ha⁻¹ and weed free environment. Similar results reported by Singh *et al.* (2017) [6]. Among other herbicides, imazethapyr 60 g ha⁻¹ (PoE) and pendimethalin 750 g (PE) also recorded next best treatments and produced significantly higher seed yield, respectively over weedy check (Yadav *et al.*, 2019) [9].

Effect on weed

The results (Table 2) showed that all herbicidal treatments either alone (imazethapyr, oxyfluorfen, pendimethalin) or ready mix (pendimethalin ready mix with imazethapyr and oxyfluorfen) caused marked reduction in weed density and dry matter of weeds at 30 and 60 DAS. Among these herbicides, pre emergence application of pendimethalin + imazethapyr (ready mix) 900 g ha⁻¹ significantly reduced the highest weed density and total weed biomass which was on par to its ready mix 800 g ha⁻¹ at 30, 60 DAS compared to rest of weed control treatments (Gelot *et al.*, 2018) [1]. Application of imazethapyr 90 g ha⁻¹ as PoE also observed significantly lower weed density and weed dry matter of weeds at 30 and 60 DAS compared to weedy check (Punia *et al.* 2015) [5].

Table 1: Effect of weed management on plant population, plant height and seed yield of mungbean

Treatments	Plant population (lakh ha ⁻¹)		Plant Height (cm)		Seed yield (kg ha ⁻¹)
	Initial	Final	At 30 DAS	At 60 DAS	
W ₁ - Weedy check	3.32	2.08	7.62	29.10	571
W ₂ - Weed free	3.33	3.23	10.00	40.52	1206
W ₃ - Oxyfluorfen 50 g ha ⁻¹ (PoE)	3.32	2.56	7.80	31.40	978
W ₄ - Oxyfluorfen 70 g ha ⁻¹ (PoE)	3.32	2.27	7.77	30.50	967
W ₅ - Imazethapyr 60 g ha ⁻¹ (PoE)	3.33	3.01	8.97	37.67	1115
W ₆ - Imazethapyr 90 g ha ⁻¹ (PoE)	3.33	2.97	8.23	37.33	1085
W ₇ - Pendimethalin 750 g ha ⁻¹ (PE)	3.33	2.98	8.73	37.50	1113
W ₈ - Pendimethalin + Oxyfluorfen 400 g ha ⁻¹ (PE)	3.32	2.75	7.93	34.63	1027
W ₉ - Pendimethalin + Oxyfluorfen 550 g ha ⁻¹ (PE)	3.32	2.88	8.08	34.67	1049
W ₁₀ - Pendimethalin + Oxyfluorfen 750 g ha ⁻¹ (PE)	3.33	2.96	8.13	36.33	1083
W ₁₁ - Pendimethalin + Imazethapyr 800 g ha ⁻¹ (PE)	3.33	3.16	9.50	38.50	1170
W ₁₂ - Pendimethalin + Imazethapyr 900 g ha ⁻¹ (PE)	3.33	3.21	9.80	39.00	1197
SEM _±	0.005	0.065	0.111	0.286	22.4
CD (P=0.05)	NS	0.192	0.325	0.838	65.7

Table 2: Effect of weed management on weed density and weed dry matter at 30 and 60 DAS

Treatments	Weed density* (No.m ⁻²)		Weed dry matter (g m ⁻²)	
	At 30 DAS	At 60 DAS	At 30 DAS	At 60 DAS
Weedy check	10.44 (108.46)	12.04 (144.5)	4.73 (21.90)	9.08 (82.01)
Weed free	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)
Oxyfluorfen 50 g ha ⁻¹ (PoE)	6.10 (26.77)	6.73 (44.83)	2.87 (7.73)	6.35 (39.85)
Oxyfluorfen 70 g ha ⁻¹ (PoE)	5.92 (34.54)	6.54 (42.33)	2.83 (7.49)	6.16 (37.42)
Imazethapyr 60 g ha ⁻¹ (PoE)	4.09 (16.21)	4.67 (21.32)	2.07 (3.80)	4.33 (18.22)

Imazethapyr 90 g ha ⁻¹ (PoE)	3.99 (15.39)	4.43 (19.14)	1.99 (3.45)	4.11 (16.42)
Pendimethalin 750 g ha ⁻¹ (PE)	4.71 (21.67)	5.61 (30.93)	2.47 (5.63)	5.17 (26.20)
Pendimethalin + Oxyfluorfen 400 g ha ⁻¹ (PE)	4.61 (20.78)	5.44 (29.17)	2.38 (5.19)	5.01 (24.58)
Pendimethalin + Oxyfluorfen 550 g ha ⁻¹ (PE)	4.53 (19.98)	5.26 (27.20)	2.33 (4.93)	4.85 (23.05)
Pendimethalin + Oxyfluorfen 750 g ha ⁻¹ (PE)	4.43 (19.14)	5.09 (25.37)	2.27 (4.67)	4.72 (21.79)
Pendimethalin + Imazethapyr 800 g ha ⁻¹ (PE)	2.75 (7.05)	3.19 (9.68)	1.41 (1.48)	2.92 (8.05)
Pendimethalin + Imazethapyr 900 g ha ⁻¹ (PE)	2.70 (6.79)	2.99 (8.43)	1.38 (1.41)	2.73 (6.93)
SEm ₊	0.017	0.072	0.018	0.067
CD (P=0.05)	0.050	0.210	0.056	0.196

$\sqrt{x + 0.5}$ Transformed values and Data in parenthesis are original values

Conclusion

On the basis the investigation it is concluded that the application of pendimethalin + imazethapyr (ready mix) 900 g ha⁻¹ resulted in obtaining the minimum weed density and weed dry matter along with the highest seed yield compared to other herbicidal weed control treatments. However, it was found on par to its ready mix at 800 g ha⁻¹ and weed free environment.

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