



Plant Archives

Journal homepage: <http://www.plantarchives.org>

DOI Url : <https://doi.org/10.51470/PLANTARCHIVES.2026.v26.no.1.329>

PERFORMANCE OF DIFFERENT DOSES OF FOMESAFEN16.8% + PROPAQUIZAFOP 5.2% HERBICIDES ON WEED DENSITY AND WEED CONTROL EFFICIENCY IN SUMMER BLACKGRAM (*VIGNA MUNGO* L.)

Vinod Kumar¹ and S.K. Mishra^{2*}

¹Scientist (Agronomy), AICRP on Integrated Farming System, JNKVV – Zonal Agricultural Research Station, Powarkheda, Narmadapuram (M.P.), India.

²Scientist, JNKVV – Dryland Horticulture Research & Training Centre, Garhakota, Sagar (M.P.), India.

*Corresponding author E-mail : mishradhrtc@gmail.com

(Date of Receiving-02-02-2026; Date of Revision-26-03-2026; Date of Acceptance-07-04-2026)

ABSTRACT

A field experiment was conducted at JNKVV – Zonal Agricultural Research Station, Powarkheda, Narmadapuram during summer 2018. The experiment comprised of nine treatments viz.; imazethapyr at 50, 75, 100 and 125 g ha⁻¹ at 20 DAS, pendimethalin at 750 g ha⁻¹ a as pre-emergence, butachlor at 1000 g ha⁻¹ as pre-emergence, hand weeding twice at 20 and 40 DAS and untreated control was laid out in randomized block design with three replications. The application of Fomesafen 16.8% + Propaquizafop 5.2% at the lowest dose (1000 ml ha⁻¹) caused appreciable reduction of grassy and broad leaf weeds viz.; *Echinochloa crusgalli*, *Cyperus rotundus*, *Cynodon dactylon*, *Commelina benghalensis*, *Phyllanthus niruri* and *Euphorbia geniculata*. Among the herbicidal weed control treatments, higher mean weed control efficiency (30 & 45 DAA) of grassy and broad leaf weeds (83.12 and 90.27%) was noted in plots receiving of Fomesafen 16.8% + Propaquizafop 5.2% 1500 ml ha⁻¹ followed by Fomesafen 16.8% + Propaquizafop 5.2% applied @ 1250 ml/ha (80.70 and 87.67%).

Key words : Black gram, Efficacy, Weeds, Weed control efficiency.

Introduction

Blackgram [*Vigna mungo* (L.) Hepper] is one of the important nutritive pulse crops. India is the largest producer and consumer of blackgram in the world. In India, it is mostly grown in summer and rainy seasons, Total production of black Gram is about 23 lakh tonnes on an area of 40 lakh hectare with the average productivity of 598 kg/ha in 2022-23 in India (Anonymous, 2023-24). In India, the important blackgram growing states are Madhya Pradesh, Rajasthan, Andhra Pradesh, Uttar Pradesh, Tamil Nadu, Maharashtra, Jharkhand, Gujarat, Karnataka and West Bengal. In Madhya Pradesh Balck gram (Urad) grown on 13.09 lakh hectares with the production of 8.50 lakh metric tonnes an average productivity 649 Kg/ha (Anonymous 2023-24). Although, the crop has got great export potential besides huge domestic requirement, a number of limiting factors have been attributed for its low productivity. Among various

production factors, weed plays vital role in influencing black gram yield. Weeds compete with the resources like nutrient, moisture and light. High temperature coupled with frequent rains during growing period infests the crop heavily with weeds, which adversely affect the productivity of this crop. An initial period of 20-40 days is very critical (Saraswat and Mishra, 1993). Season long weed competition causes yield reduction to the extent of 27-84% depending on the kind and intensity of weed species (Bhowmick *et al.*, 2015). Weeds are controlled by various methods like cultural, manual, mechanical, biological and chemical. Manual and mechanical weeding is laborer intensive and tedious. Many times labours are not available at peak time of requirement for weeding. Even if they are available the escalating cost of laborers further limits its option. The cultural method of weed control like adoption of suitable crop rotation, stale seed bed method, reduced tillage and soil solarization etc are

long term planning. The chemical method of weed control is not only cost effective but also is efficient in minimizing weed infestation for longer period provided they are applied judiciously *i.e.*; with suitable herbicide, in dose and time. Fomesafen 25% SL is an effective post-emergence herbicide for controlling non-grassy weeds (Singh *et al.*, 2014), whereas, propaquizafop 10% EC takes care of grassy weeds in soybean (Tiwari and Mathew, 2002). However, the efficacy of Fomesafen 16.8% + Propaquizafop 5.2% has not been evaluated for weed management in blackgram under Central Narmada Valley Zone of Madhya Pradesh. Hence, the present investigation was undertaken to determine the performance of different doses of Fomesafen 16.8% + Propaquizafop 5.2% herbicides on weed density and weed control efficiency in summer blackgram.

Materials and Methods

A field experiment was conducted at JNKVV – Zonal Agricultural Research Station, Powarkheda, Narmadapuram during summer 2018. The experiment comprised of nine treatments *viz.*; imazethapyr at 50, 75, 100 and 125 g ha⁻¹ at 20 DAS, pendimethalin at 750 g ha⁻¹ as pre-emergence, butachlor at 1000 g ha⁻¹ as pre-emergence, hand weeding twice at 20 and 40 DAS and untreated control was laid out in randomized block design with three replications. Blackgram variety ‘Azad 1’ was fertilized with 20 kg N, 60 kg of P₂O₅ and 20 kg K₂O per hectare through urea, SSP and MOP, respectively. The entire dose of NPK was applied as basal. Hand operated knapsack sprayer fitted with a flat fan type nozzle was used for spraying the herbicides by adopting a spray volume of 500 litres/ha. All the recommended agronomic and plant protection measures were adopted to raise the crop. The density of grasses, sedges and broadleaved weeds were recorded at 15, 30 and 45 DAA by placing a quadrat of 50×50 cm from the marked sampling area of 1.0 m² in each plot. For recording their biomass, weed samples were sun-dried and later oven dried at 70°C until constant weight was attained. These were subjected to square root transformation to normalize their distribution. Weed control efficiency (%) was computed using the following formula:

$$\text{WCE} = \frac{\text{Dry wt. of weeds in control plot} - \text{Dry wt. of weeds in treatment plot}}{\text{Dry wt. of weeds in control plot}} \times 100$$

Results and Discussion

Weed flora of black gram : Data on species wise weed density recorded in weedy check plots at 15, 30 and 45 DAA are given in Table 1. In the experimental

field six weed species were found to be dominant and contributed about 100 per cent of total weed flora of grassy and broad leaf weeds. There was predominance of grassy weeds (57.30%) in weedy check plot of black gram at Powarkheda, District Narmadapuram (MP). Among the grassy weeds, *Echinochloa crusgalli* was the most dominant weed as it was having the maximum relative density (38.98%) followed by broad leaf weed *Phyllanthus niruri* (16.47%). Whereas, broad leaf weeds contributed (42.70%) to the total weed density.

Effect on weeds : The data recorded on density of associated weeds *viz.*, *Echinochloa crusgalli*, *Cyperus rotundus*, *Cynodon dactylon*, *Commelina benghalensis*, *Phyllanthus niruri* and *Euphorbia geniculata* at before application, 15, 30 and 45 days after application as influenced by different weed control treatments are presented in Tables 2, 3 and 4. The data on weed biomass recorded at 30 and 45 days after application are presented in Tables 5, 6 and 7. The comparison among the treatment means have been made on the basis of transformed values in case of weed parameters only.

Grassy weeds

***Echinochloa crusgalli* :** The density of *Echinochloa crusgalli* at before application 15, 30 and 45 days after application is presented in Table 2. The density of *Echinochloa crusgalli* was maximum (13.68 m⁻²) under weedy check plots at 45 DAA. It was affected significantly when weed control measures were adopted in different plots. Post emergence application of Fomesafen 16.8% + Propaquizafop 5.2% @ 1000 ml ha⁻¹ caused appreciable reduction in the density (6.38 m⁻²) of *Echinochloa crusgalli* over weedy check plots. However, the efficacy of Fomesafen 16.8% + Propaquizafop 5.2% was further improved with the corresponding increase in the rates of application from 1250 to 1500 ml ha⁻¹. Hand weeding at 20 and 40 DAS had lowest weed density (1.91 m⁻²).

***Cyperus rotundus* :** Density of *Cyperus rotundus* was recorded at before application, 15, 30 and 45 days after application under different weed control treatments and are presented in Table 2. It is obvious from the data that all the herbicidal treatments including hand weeding had lowered the density (1.91 m⁻²) of *Cyperus rotundus* significantly at 45 DAA as compared to weedy check plots (7.79 m⁻²). Post emergence application of Fomesafen 16.8% + Propaquizafop 5.2% at the rate of 1000 ml ha⁻¹ caused appreciable reduction (3.71 m⁻²) in the density of *Cyperus rotundus* over weedy check plots. The effect was further increased with the corresponding

Table 1 : Weed flora of black gram in weedy check plots at 15, 30 and 45 DAA.

S. no.	Weed flora	Density/m ²			Mean	Relative Density (%)
		15 DAA	30 DAA	45 DAA		
Grassy Weeds						
1.	<i>Echinochloa crusgalli</i>	115.75	145.25	170.45	143.82	38.98
2.	<i>Cyperus rotundus</i>	25.65	40.25	49.85	38.58	10.46
3.	<i>Cynodon dactylon</i>	16.85	30.35	39.85	29.02	7.86
	Sub Total		211.42	57.30		
Broad leaf Weeds						
4.	<i>Commelina benghalensis</i>	28.05	54.25	65.00	49.10	13.31
5.	<i>Phyllanthus niruri</i>	38.55	69.55	74.25	60.78	16.47
6.	<i>Euphorbia geniculata</i>	35.25	51.85	55.85	47.65	12.92
	Sub Total		157.53	42.70		
	Total		368.95	100.00		

increase in application rates of Fomesafen 16.8% + Propaquizafop 5.2% from 1250 to 1500 ml ha⁻¹.

Cynodon dactylon : The density of *Cynodon dactylon* as affected by different weed control treatments

at before application, 15, 30 and 45 days after application has been given in Table 3. It is obvious from the data that the weed control treatments caused significant influence on the density of *Cynodon dactylon* at 15, 30 & 45 DAA. The density of *Cynodon dactylon* was maximum (7.17 m⁻²) under weedy check plots at 45 DAA. There was identical reduction in the density of *Cynodon dactylon* when herbicidal weed control measures were adopted. The application of Fomesafen 16.8% + Propaquizafop 5.2% at 1000 ml ha⁻¹ as post emergence caused significant reduction (3.30 m⁻²) in the density of *Cynodon dactylon*

over weedy check plots. The efficacy of Fomesafen 16.8% + Propaquizafop 5.2% was increased appreciably with the increase in application rates from 1250 to 1500 ml ha⁻¹.

Table 2 : Density of weeds at different intervals as influenced by weed control treatments.

Treatment	Doses (g or ml ha ⁻¹) Formulation	<i>Echinochloa crusgalli</i> (m ⁻²)				<i>Cyperus rotundus</i> (m ⁻²)			
		Before application	15 *DAA	30 DAA	45 DAA	Before application	15 DAA	30 DAA	45 DAA
Fomesafen 16.8% + Propaquizafop 5.2%	1000	10.76	9.94	7.42	6.38	5.07	4.54	3.87	3.71
		*115.25	98.25	54.50	40.15	25.20	20.15	14.45	13.25
Fomesafen 16.8% + Propaquizafop 5.2%	1250	10.76	9.55	6.52	5.54	5.09	4.31	3.58	3.25
		115.3	90.65	42.05	30.15	25.45	18.10	12.35	10.05
Fomesafen 16.8% + Propaquizafop 5.2%	1500	10.76	8.77	6.36	5.09	5.08	4.18	3.32	3.11
		115.35	76.50	40.00	25.45	25.30	17.00	10.50	9.15
Fomesafen 25% SL	1000	10.77	11.86	12.88	13.46	5.08	6.24	6.81	7.46
		115.45	140.10	165.35	180.65	25.35	38.50	45.85	55.2
Propaquizafop 10% EC	1000	10.76	9.04	6.86	5.24	5.11	4.54	3.57	3.32
		115.25	81.25	46.50	27.00	25.60	20.10	12.25	10.50
Propaquizafop 2.5% + Imazethapyr 3.75% ME	2000	10.77	9.58	7.15	5.71	5.11	4.65	3.69	3.31
		115.55	91.35	50.65	32.12	25.65	21.15	13.15	10.45
Weed free check (Hand weeding)	20 & 40 DAS	10.76	3.26	2.44	1.91	5.09	2.86	2.47	1.91
		115.35	10.15	5.45	3.15	25.40	7.67	5.60	3.15
Untreated control (Weedy check)	-	10.78	12.07	13.07	13.68	5.11	6.38	7.10	7.79
		115.75	145.25	170.45	186.55	25.65	40.25	49.85	60.15
S.Em±		0.36	0.14	0.22	0.24	0.62	0.07	0.08	0.14
CD (p=0.05)		NS	0.42	0.66	0.73	NS	0.21	0.24	0.42

* DAA – days after application

*Bold figures are the original values.

Table 3 : Density of weeds at different intervals as influenced by weed control treatments

Treatment	Doses (g or ml ha ⁻¹) Formulation	<i>Cynodon dactylon</i> (m ²)				<i>Commelina benghalensis</i> (m ²)			
		Before application	15 *DAA	30 DAA	45 DAA	Before application	15 DAA	30 DAA	45 DAA
Fomesafen 16.8% + Propaquizafop 5.2%	1000	4.09	3.87	3.39	3.30	6.23	4.90	4.22	3.87
		*16.25	14.50	11.00	10.40	38.35	23.55	17.35	14.45
Fomesafen 16.8% + Propaquizafop 5.2%	1250	4.10	3.38	2.75	2.58	6.24	4.30	3.94	3.57
		16.35	10.95	7.06	6.15	38.45	18.00	15.05	12.25
Fomesafen 16.8% + Propaquizafop 5.2%	1500	4.12	3.04	2.42	2.20	6.24	3.87	3.56	3.34
		16.45	8.75	5.33	4.35	38.4	14.45	12.20	10.65
Fomesafen 25% SL	1000	4.11	5.10	5.98	6.78	6.27	8.12	8.38	9.10
		16.4	25.50	35.25	45.50	38.85	65.45	69.80	82.35
Propaquizafop 10% EC	1000	4.14	3.81	3.58	3.28	6.23	4.36	3.97	3.58
		16.65	14.00	12.35	10.25	38.3	18.50	15.25	12.35
Propaquizafop 2.5% + Imazethapyr 3.75% ME	2000	4.10	3.57	3.40	3.29	6.26	4.49	4.09	3.61
		16.35	12.25	11.05	10.30	38.75	19.65	16.25	12.50
Weed free check (Hand weeding)	20 & 40DAS	4.12	1.96	1.87	1.58	6.26	2.44	1.94	1.50
		16.45	3.33	3.00	2.00	38.65	5.45	3.25	1.75
Untreated control (Weedy check)	-	4.17	5.55	6.35	7.17	6.25	8.37	8.65	9.43
		16.85	30.35	39.85	50.85	38.55	69.55	74.25	88.45
S.Em±		0.33	0.07	0.05	0.13	0.43	0.25	0.07	0.06
CD (p=0.05)		NS	0.21	0.015	0.39	NS	0.75	0.21	0.18

* DAA – days after application

*Bold figures are the original values.

Broad leaf weeds

Commelina benghalensis : Data on density of *Commelina benghalensis* at before application, 15, 30 and 45 days after application under different weed control treatments has been presented in Table 3. Data showed that weed control treatments caused marked influence on the density of *Commelina benghalensis* at all stages. The density of *Commelina benghalensis* was maximum (9.43 m²) under weedy check plots at 45 DAA. The application of Fomesafen16.8% + Propaquizafop 5.2% at the lowest dose (1000 ml ha⁻¹) as post emergence caused significant reduction in the density of *Commelina benghalensis* over weedy check plots. But, the efficacy was increased significantly with the increase in the application rates, being higher when the application of Fomesafen16.8% + Propaquizafop 5.2% was done at 1500 ml ha⁻¹ (3.34 m²) followed by Fomesafen16.8% + Propaquizafop 5.2% at 1250 ml ha⁻¹ (3.57 m²) which proved statistically superior over other herbicidal weed control measures.

Phyllanthus niruri : Data on density of *Phyllanthus niruri* at before application 15, 30 and 45 days after application under different weed control treatments has been presented in Table 4. Data showed that weed control treatments caused significant influence on the density of *Phyllanthus niruri* at 15, 30 & 45 DAA. The density of *Phyllanthus niruri* was maximum (8.69 m²) under weedy check plots at 45 DAA. The post emergence application of Fomesafen16.8% + Propaquizafop 5.2% resulted in significant reduction in the density of *Phyllanthus niruri*. Application of Fomesafen16.8% + Propaquizafop 5.2% at 1000 ml ha⁻¹ caused significant reduction (2.24 m²) in the density of this weed. The efficacy of herbicide was further improved gradually with increase in the rates of application from 1250 ml ha⁻¹ to 1500 ml ha⁻¹ (2.24 and 1.96 m² respectively) and proved superior over other herbicidal treatments.

Euphorbia geniculata : The density of *Euphorbia geniculata* under different weed control treatments at before application, 15, 30 and 45 DAA has been given in Table 4. It is obvious from the data that the weed control

Table 4 : Density of weeds at different intervals as influenced by weed control treatments.

Treatment	Doses (g or ml ha ⁻¹) Formulation	<i>Phyllanthus niruri</i> (m ²)				<i>Euphorbia geniculata</i> (m ²)			
		Before application	15 *DAA	30 DAA	45 DAA	Before application	15 DAA	30 DAA	45 DAA
Fomesafen 16.8% + Propaquizafop 5.2%	1000	5.36	4.10	2.94	2.24	5.98	4.57	3.16	2.40
		*28.25	16.35	8.15	4.50	35.25	20.40	9.48	5.25
Fomesafen 16.8% + Propaquizafop 5.2%	1250	5.39	3.54	2.60	1.96	6.00	3.67	2.31	1.78
		28.5	12.00	6.25	3.35	35.45	12.99	4.85	2.67
Fomesafen 16.8% + Propaquizafop 5.2%	1500	35.00	2.80	2.25	1.47	5.99	3.46	2.01	1.47
		28.35	7.33	4.56	1.65	35.35	11.50	3.55	1.65
Fomesafen 25% SL	1000	5.36	3.64	2.70	1.97	5.97	3.56	2.14	1.77
		28.25	12.75	6.78	3.40	35.14	12.15	4.10	2.65
Propaquizafop 10% EC	1000	5.39	7.00	7.75	8.30	5.99	6.95	7.20	7.79
		28.55	48.45	59.55	68.45	35.33	47.85	51.35	60.15
Propaquizafop 2.5% + Imazethapyr 3.75% ME	2000	5.40	3.58	2.70	2.07	5.98	4.36	2.92	1.86
		28.65	12.35	6.80	3.80	35.28	18.55	8.05	2.95
Weed free check (Hand weeding)	20 & 40DAS	5.35	1.66	1.58	1.22	5.99	2.00	1.58	1.22
		28.15	2.25	2.00	1.00	35.41	3.50	2.00	1.00
Untreated control (Weedy check)	-	5.34	7.40	8.09	8.69	5.98	7.24	7.51	8.14
		28.05	54.25	65.00	75.00	35.25	51.85	55.85	65.80
S.Em±		0.35	0.15	0.04	0.07	0.45	0.05	0.23	0.21
CD (p=0.05)		NS	0.48	0.09	0.21	NS	0.15	0.69	0.63

* DAA – days after application.

*Bold figures are the original values.

Table 5 : Effect of weed control treatments on dry weight of weeds at 30 and 45 DAA in black gram.

Treatment	Doses (g or ml ha ⁻¹) Formulation	<i>Echinochloa crusgalli</i> (gm ²)		<i>Cyperus rotundus</i> (gm ²)	
		30DAA	45DAA	30DAA	45DAA
Fomesafen 16.8% + Propaquizafop 5.2%	1000	8.28	7.79	4.14	4.13
		*68.13	60.23	16.62	16.56
Fomesafen 16.8% + Propaquizafop 5.2%	1250	7.28	6.76	3.83	3.61
		52.56	45.23	14.20	12.56
Fomesafen 16.8% + Propaquizafop 5.2%	1500	7.11	6.22	3.55	3.46
		50.00	38.18	12.08	11.44
Fomesafen 25% SL	1000	14.39	16.48	7.30	8.34
		206.69	270.98	52.73	69.00
Propaquizafop 10% EC	1000	7.66	6.40	3.82	3.69
		58.13	40.50	14.09	13.13
Propaquizafop 2.5% + Imazethapyr 3.75% ME	2000	7.99	6.98	3.95	3.68
		63.31	48.18	15.12	13.06

Table 5 continued...

Table 5 continued...

Weed free check (Hand weeding)	20 & 40 DAS	2.70	2.29	2.63	2.11
		6.81	4.73	6.44	3.94
Untreated control (Weedy check)	-	14.61	16.74	7.60	8.70
		213.06	279.83	57.33	75.19
S.Em±		0.30	0.31	0.24	0.18
CD (p=0.05)		0.90	0.93	0.72	0.54

* DAA – days after application

*Bold figures are the original values.

Table 6 : Effect of weed control treatments on dry weight of weeds at 30 and 45 DAA in black gram.

Treatment	Doses (g or ml ha ⁻¹) Formulation	<i>Cynodon dactylon</i> (g m ⁻²)		<i>Commelina benghalensis</i> (g m ⁻²)	
		30DAA	45DAA	30DAA	45DAA
Fomesafen 16.8% + Propaquizafop 5.2%	1000	4.12	5.15	6.29	7.45
		*16.50	26.00	39.04	55.00
Fomesafen 16.8% + Propaquizafop 5.2%	1250	3.33	3.98	5.86	6.10
		10.59	15.38	33.86	36.75
Fomesafen 16.8% + Propaquizafop 5.2%	1500	2.92	3.37	5.29	5.70
		8.00	10.88	27.45	31.95
Fomesafen 25% SL	1000	7.31	10.69	12.55	15.73
		52.88	113.75	157.05	247.05
Propaquizafop 10% EC	1000	4.36	5.11	5.90	6.13
		18.53	25.63	34.31	37.05
Propaquizafop 2.5% + Imazethapyr 3.75% ME	2000	4.13	5.12	6.09	6.16
		16.58	25.75	36.56	37.50
Weed free check (Hand weeding)	20 & 40 DAS	2.24	2.35	2.80	2.40
		4.50	5.00	7.31	5.25
Untreated control (Weedy check)	-	7.76	11.30	12.94	16.30
		59.78	127.13	167.06	265.35
S.Em±		0.33	0.40	0.25	0.20
CD (p=0.05)		0.99	1.20	0.76	0.60

* DAA – days after application

*Bold figures are the original values

Table 7 : Effect of weed control treatments on dry weight of weeds at 30 and 45 DAA in black gram.

Treatment		<i>Phyllanthus niruri</i> (g m ⁻²)		<i>Euphorbia geniculata</i> (g m ⁻²)	
		30DAA	45DAA	30DAA	45DAA
Fomesafen 16.8% + Propaquizafop 5.2%	1000	4.10	3.74	5.60	4.34
		*16.30	13.50	30.81	18.38
Fomesafen 16.8% + Propaquizafop 5.2%	1250	3.61	3.25	4.03	3.14
		12.50	10.05	15.76	9.33

Table 7 continued...

Table 7 continued...

Fomesafen 16.8% + Propaquizafop 5.2%	1500	3.10	2.33	3.47	2.50
		9.12	4.95	11.54	5.78
Fomesafen 25% SL	1000	3.75	3.27	3.72	3.13
		13.56	10.20	13.33	9.28
Propaquizafop 10% EC	1000	10.94	14.35	12.94	14.53
		119.10	205.35	166.89	210.53
Propaquizafop 2.5% + Imazethapyr 3.75% ME	2000	3.75	3.45	5.16	3.29
		13.60	11.40	26.16	10.33
Weed free check (Hand weeding)	20 & 40 DAS	2.12	1.87	2.65	2.00
		4.00	3.00	6.50	3.50
Untreated control (Weedy check)	-	11.42	15.02	13.49	15.19
		130.00	225.00	181.51	230.30
S.Em±		0.25	0.21	0.23	0.21
CD (p=0.05)		0.75	0.63	0.69	0.63

* DAA – days after application

*Bold figures are the original values

Table 8 : Weed control efficiency of grassy weeds at different intervals as influenced by weed control treatments.

Tr. no.	Treatment	Dose ml or g/ha formulation	Grassy weeds (WCE %)		
			30 DAA	45 DAA	Mean
T ₁	Fomesafen 16.8% + Propaquizafop 5.2%	1000	69.34	78.68	74.01
T ₂	Fomesafen 16.8% + Propaquizafop 5.2%	1250	76.57	84.83	80.70
T ₃	Fomesafen 16.8% + Propaquizafop 5.2%	1500	78.78	87.45	83.12
T ₄	Fomesafen 25% SL	1000	5.42	5.89	5.65
T ₅	Propaquizafop 10% EC	1000	72.52	83.56	78.04
T ₆	Propaquizafop 2.5% + Imazethapyr 3.75% ME	2000	71.22	81.96	76.59
T ₇	Weed free check (Hand weeding)	20 & 40 DAS	94.62	97.17	95.89
T ₈	Untreated control (Weedy check)	-	0.00	0.00	0.00

Table 9 : Weed control efficiency of broad leaf weeds at different intervals as influenced by weed control treatments.

Tr. no.	Treatment	Dose ml or g/ha formulation	Broad leaf weeds (WCE %)		
			30 DAA	45 DAA	Mean
T ₁	Fomesafen 16.8% + Propaquizafop 5.2%	1000	81.00	82.30	81.65
T ₂	Fomesafen 16.8% + Propaquizafop 5.2%	1250	87.02	88.25	87.64
T ₃	Fomesafen 16.8% + Propaquizafop 5.2%	1500	89.95	90.59	90.27
T ₄	Fomesafen 25% SL	1000	71.57	75.00	73.29
T ₅	Propaquizafop 10% EC	1000	16.07	17.50	16.79
T ₆	Propaquizafop 2.5% + Imazethapyr 3.75% ME	2000	70.05	71.00	70.53
T ₇	Weed free check (Hand weeding)	20 & 40 DAS	96.28	97.19	96.74
T ₈	Untreated control (Weedy check)	-	0.00	0.00	0.00

treatments caused significant influence on the density of *Euphorbia geniculata* at 15, 30 and 45 DAA. The density of *Euphorbia geniculata* was maximum (8.14 m⁻²) under weedy check plots at 45 DAA, whereas there was identical reduction in the density of *Euphorbia*

geniculata when herbicidal weed control measures were adopted. The application of Fomesafen 16.8% + Propaquizafop 5.2% @ 1000 ml ha⁻¹ as post emergence caused significant reduction (2.40 m⁻²) in the density of *Euphorbia geniculata* over weedy check plots. But,

the efficacy of mixture was increased appreciably with the increase in application rates from 1250 to 1500 ml ha⁻¹.

Weed control efficiency (WCE %) : Weed control efficiency in percent (WCE %) was calculated on the basis of weed biomass obtained under weedy check and other treatments at different time intervals (30 & 45 DAA) which is given in Tables 6, 7 and 8 and the data on WCE (%) are presented in Tables 8 and 9. Among the herbicidal weed control treatments, higher mean weed control efficiency (30 & 45 DAA) of grassy and broad leaf weeds (83.12 and 90.27%) was noted in plots receiving of Fomesafen 16.8% + Propaquizafop 5.2% 1500 ml ha⁻¹ followed by Fomesafen 16.8% + Propaquizafop 5.2% applied @ 1250 ml/ha (80.70 and 87.67%). However lower WCE was Fomesafen 25% SL at 1000 ml ha⁻¹ in grassy weeds (5.65) and Propaquizafop 10% EC at 1000 ml ha⁻¹ in broad leaf weeds (16.79%) was lowest. The highest reduction in dry weight of grassy and broad leaf weeds was recorded (95.89 and 96.74% WCE) under hand weeding twice (20 and 40 DAS) in black gram and proved superior over herbicidal treatments.

Acknowledgement

We would like to express our sincere gratitude to the Director Research Services, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur and Associate Director

Research, JNKVV – Zonal Agricultural Research Station, Powarkheda, Narmadapuram for providing the necessary facilities and continuous support throughout our research work.

References

- Anonymous (2023-24). ANGRAU-Crop Outlook Reports of Andhra Pradesh Black gram– June to May, 2023-24.
- Anonymous (2023-24). DES, GoI, Min. of Agri. & FW (DA & FW).
- Bhowmick, M.K., Duary B. and Biswas P.K. (2015). Integrated weed management in blackgram. *Indian J. Weed Sci.*, **47**, 34–37.
- Saraswat, V.N. and Mishra J.S. (1993). Weed management in pulse crops. *Proc. Int. Symp.*, ISWS, Hisar, Nov. 18-20. Vol. III.
- Singh, Dheer, Nazim Hamid Mir, Nipendra Singh and Jitendra Kumar (2014). Promising early post-emergence herbicides for effective weed management in soybean. *Indian J. Weed Sci.*, **46(2)**, 135–137, 2014
- Singh, V.P., Singh S.P., Kumar A., Tripathi N. and Nainwal R.C. (2010). Efficacy of Haloxyfop, a post-emergence herbicide on weeds and yield of soybean. *Indian J. Weed Sci.*, **42(1&2)**: 83-86.
- Tiwari, B.K. and Mathew R. (2002). Influence of post-emergence herbicides on growth and yield of soybean. *JNKVV Res. J.*, **36(2)**, 17–21.