



E-ISSN: 2618-0618
P-ISSN: 2618-060X
© Agronomy
NAAS Rating (2026): 5.20
www.agronomyjournals.com
2026; 9(6): 1105-1108
Received: 14-04-2026
Accepted: 18-05-2026

N Shyam Kumar
PG Student, Department of
Agronomy, Agricultural College,
Naira, Andhra Pradesh, India

M Srinivasa Rao
Scientist (Agronomy), Agricultural
Research Station, Ragolu,
Srikakulam, Andhra Pradesh,
India

A Upendra Rao
Senior Professor and Head,
Department of Agronomy,
Agricultural College, Naira,
Andhra Pradesh, India

S Govinda Rao
Assistant Professor, Department of
statistics and Computer
Applications, Agricultural College,
Naira, Andhra Pradesh, India

Corresponding Author:
N Shyam Kumar
PG Student, Department of
Agronomy, Agricultural College,
Naira, Andhra Pradesh, India

International Journal of Research in Agronomy

Effect of different ready-mix herbicide combinations on growth performance of rice-fallow blackgram (*Vigna mungo* L.)

N Shyam Kumar, M Srinivasa Rao, A Upendra Rao and S Govinda Rao

DOI: <https://www.doi.org/10.33545/2618060X.2026.v9.i6n.5834>

Abstract

Rice-fallow blackgram is highly vulnerable to weed infestation during its early growth stages and uncontrolled weeds can substantially reduce crop growth by competing for nutrients, moisture, light and space. In view of this a field experiment was conducted during *rabi* 2025-26 at the Agricultural Research Station, Ragolu, Andhra Pradesh, to evaluate the effect of herbicide ready-mix combinations on growth of rice-fallow blackgram (*Vigna mungo* L.). The experiment was laid out in a randomized block design with ten treatments and three replications on sandy clay loam soil. The treatments included one pre-emergence and seven post-emergence herbicide ready-mix combinations, along with weed-free and weedy check treatments. The herbicide treatments did not exert a significant influence on the growth parameters of rice-fallow blackgram during the early stage of crop growth (20 DAS), suggesting that weed competition was relatively low at this stage. However, pronounced differences among treatments were observed at 60 DAS. The weed-free check (T₉) consistently recorded the highest values for plant height, number of branches, nodulation, leaf area index and dry matter production. Among the herbicide ready-mix combinations, post-emergence application of fomesafen 16.8% + propaquizafop 5.2% ME (T₅) proved to be the most effective, resulting in superior growth performance. This treatment was closely followed by fomesafen 12.5% + quizalofop-P-ethyl 4.68% ME (T₃) and fomesafen 11.1% + fluazifop-P-butyl 11.1% ME (T₄). The better growth observed under these treatments may be attributed to efficient weed suppression, which reduced competition for nutrients, moisture and sunlight, thereby creating favourable conditions for crop growth and biomass accumulation. In contrast, the weedy check recorded the poor growth performance due to continuous weed interference throughout the crop growth period. The findings indicate that fomesafen 16.8% + propaquizafop 5.2% ME can be considered an effective herbicide ready-mix option for improving the growth and biomass production of rice-fallow blackgram.

Keywords: Ready-mix herbicides, fomesafen, propaquizafop, fluazifop-P-butyl and quizalofop-P-ethyl

1. Introduction

Blackgram (*Vigna mungo* L.) is one of the most important pulse crops cultivated in India and plays a significant role in improving soil fertility through biological nitrogen fixation of 20-50 kg ha⁻¹ (Shankar *et al.*, 2025) [13]. In rice-fallow ecosystems, blackgram is commonly grown using residual soil moisture after rice harvest, providing an opportunity to increase cropping intensity and enhance farm income. The growth and development of blackgram under rice-fallow conditions largely depend on efficient utilization of available resources such as nutrients, moisture, light and space (Das *et al.*, 2024) [1]. Weed infestation is one of the major constraints limiting the growth potential of rice-fallow blackgram. During the early stages of crop growth, weeds compete aggressively with the crop for essential resources, resulting in reduced plant height, lower dry matter accumulation, poor branching and restricted leaf area development (Mudalagiriappa *et al.*, 2022) [10]. Such adverse effects ultimately impair crop vigour and productivity. The critical period of crop-weed competition (20-40 DAS) in blackgram generally occurs during the initial growth phase, when the crop is highly sensitive to weed interference (Manohar *et al.*, 2024) [8]. Effective weed management is therefore essential to ensure vigorous crop growth. Ready-mix herbicides containing two or more active ingredients have emerged as a promising option for broad-spectrum weed control. These formulations help reduce weed competition and create

favourable conditions for crop establishment and growth (Maji *et al.*, 2025) ^[7]. Hence, the present study was undertaken to evaluate the influence of different ready-mix herbicide combinations on the growth parameters of rice-fallow blackgram.

2. Materials and Methods

A field experiment was conducted during the *rabi* season of 2025-26 at the Agricultural Research Station, Ragolu, Srikakulam, Andhra Pradesh, India. The experimental site is located at 18.34° N latitude and 83.89° E longitude with an altitude of 27 m above mean sea level in the North Coastal Zone of Andhra Pradesh. The soil of the experimental field was sandy clay loam in texture, neutral in reaction, medium in organic carbon (0.58), available nitrogen (284.1 kg ha⁻¹) and potassium (264.6 kg ha⁻¹) status, while the available phosphorus was high (36.5 kg ha⁻¹). The experimental field received a total rainfall of 14.5 mm in 2 rainy days of the 48th standard meteorological week. The mean maximum and minimum temperatures ranged from 27.6 to 32.8 °C and 14.4 to 20.6 °C, respectively. The experiment was laid out in a randomized block design (RBD) with ten treatments replicated thrice. The treatments comprised: pre-emergence (PE) application of Pendimethalin 30% + Imazethapyr 2% EC @ 800 g a.i. ha⁻¹ (T₁), post-emergence (PoE) application of Propaquizafop 2.5% + Imazethapyr 3.75% ME @ 125 g a.i. ha⁻¹ (T₂), Fomesafen 12.5% + Quizalofop-P-ethyl 4.68% ME @ 174.8 g a.i. ha⁻¹ (T₃), Fomesafen 11.1% + Fluazifop-P-butyl 11.1% ME @ 222 g a.i. ha⁻¹ (T₄), Fomesafen 16.8% + Propaquizafop 5.2% ME @ 137.5 g a.i. ha⁻¹ (T₅), Sodium acifluorfen 16.5% + Clodinafop 8% EC @ 245 g a.i. ha⁻¹ (T₆), Quizalofop-ethyl 7.5% + Imazethapyr 15% EC @ 84 g a.i. ha⁻¹ (T₇), Imazethapyr 35% + Imazamox 35% WG @ 28 g a.i. ha⁻¹ (T₈), Weed-free check (T₉) and Weedy check (T₁₀). Blackgram variety “LBG-884” was broadcast on 24.11.2025 and raised under rice-fallow conditions utilising residual soil moisture without any preparatory tillage operations and it was harvested on 19.02.2026. Since there is no recommendation for basal fertilizer application under rice-fallow blackgram, foliar nutrition was provided through spraying of 19:19:19 fertilizer @ 5 g L⁻¹ at flowering stage, followed by 13:0:45 fertilizer @ 1 g L⁻¹ at the pod development stage to enhance pod filling and seed development. Growth parameters such as plant height, number of branches plant⁻¹, number of nodules plant⁻¹ and dry matter production were recorded at 20 and 60 DAS. Plant height was measured from the base of the plant to the tip of the growing point, while the number of branches was counted from five randomly tagged plants in each plot and expressed on a plant basis. Nodulation was assessed through destructive sampling by carefully uprooting five plants from each treatment, washing the roots and counting the nodules manually. Dry matter production was determined by oven-drying the sampled plants at 65°C, using the method proposed by Watson (1952) ^[18] and until a constant weight was attained and expressed as kg ha⁻¹.

3. Results and Discussion

3.1. Plant height

Plant height of rice-fallow blackgram was not significantly influenced by the herbicide treatments at 20 DAS. However, the weed-free check (T₉) recorded a numerically higher plant height (14.50 cm), followed by pre-emergence application of Pendimethalin 30% + Imazethapyr 2% EC (T₁) (12.80 cm). The non-significant differences at this stage could be attributed to the absence of post-emergence herbicide application and relatively lower crop-weed competition during the early growth period. At 60 DAS, significant differences in plant height were observed

among the herbicidal ready-mix treatments. The weed-free check (T₉) registered the highest plant height (37.51 cm), while among the herbicide ready-mix combinations, fomesafen 16.8% + propaquizafop 5.2% ME (T₅) recorded superior plant height (33.42 cm), which was followed by fomesafen 12.5% + quizalofop-P-ethyl 4.68% ME (T₃) and fomesafen 11.1% + fluazifop-P-butyl 11.1% ME (T₄). The enhanced plant growth under these treatments could be attributed to effective weed suppression, which reduced competition for nutrients, moisture and light, thereby promoting better crop vigour and growth (Kumar *et al.*, 2025 and Harisha *et al.*, 2021) ^[5,3]. The lowest plant height was recorded under the weedy check (T₁₀) due to severe weed competition throughout the crop growth period (Shashidhar *et al.*, 2020) ^[14].

3.2. No. of branches (no. plant⁻¹)

At 20 DAS, the herbicide treatments had no significant effect on the number of branches plant⁻¹. This may be due to, no post-emergence herbicide ready-mix application, but the weed-free check (T₉) showed a comparatively larger number of branches than all other treatments. The treatments differed significantly at 60 DAS. Among herbicide ready-mix combinations, fomesafen 16.8% + propaquizafop 5.2% ME (T₅) showed better branching, followed by fomesafen 12.5% + quizalofop-P-ethyl 4.68% ME (T₃) and fomesafen 11.1% + fluazifop-P-butyl 11.1% ME (T₄), which are statistically on par with each other. The weed-free check (T₉), on the other hand, produced the most branches plant⁻¹ (Jain *et al.*, 2025) ^[4]. This could be because weeds were effectively controlled during the critical crop growth phase, which may have improved branching under these treatments by increasing the availability of nutrients, moisture and light, which promoted strong vegetative growth (Singh *et al.*, 2022) ^[16]. The weedy check (T₁₀) indicated the fewest branches plant⁻¹ because of continuous weed competition during the crop growth period.

3.3. No. of nodules (no. plant⁻¹)

The herbicide ready-mix treatments did not exert a significant effect on the number of nodules plant⁻¹ at 20 DAS, though minor numerical variations were noticed among the treatments. The weed-free check (T₉) registered a relatively higher number of nodules may be due to favourable environment. In contrast, significant differences in nodulation were observed at 60 DAS. The weed-free check (T₉) produced the maximum number of nodules plant⁻¹ and was comparable with fomesafen 16.8% + propaquizafop 5.2% ME (T₅), fomesafen 12.5% + quizalofop-P-ethyl 4.68% ME (T₃), imazethapyr 35% + imazamox 35% WG (T₈) and fomesafen 11.1% + fluazifop-P-butyl 11.1% ME (T₄). The improved nodulation under these treatments could be attributed to effective weed suppression, which minimized crop-weed competition and promoted better root development, nutrient uptake and Rhizobium activity, resulting in enhanced biological nitrogen fixation (Maji *et al.*, 2025 and Susmitha *et al.*, 2019) ^[7, 17].

3.4. Leaf area index (%)

Leaf area index was not significantly affected by the herbicide ready-mix treatments at 20 DAS, although the weed-free check (T₉) registered comparatively higher LAI values. The non-significant response at the initial growth stage could be due to lower weed pressure. However, significant differences were observed at 60 DAS. The weed-free check (T₉) recorded the highest LAI and remained comparable with fomesafen 12.5% + quizalofop-P-ethyl 4.68% ME (T₃), fomesafen 11.1% + fluazifop-P-butyl 11.1% ME (T₄), imazethapyr 35% + imazamox 35% WG

(T₈) and fomesafen 16.8% + propaquizafop 5.2% ME (T₅). The higher LAI under these treatments may be attributed to effective weed control, which ensured better availability of nutrients, moisture and light, thereby promoting greater leaf expansion and canopy growth (Dhayal *et al.*, 2022) ^[2]. In contrast, the weedy check (T₁₀) recorded the lowest LAI owing to prolonged crop-weed competition that adversely affected crop growth and canopy development. Similar findings on the beneficial effect of efficient weed management on canopy development and LAI were reported by Kumar *et al.* (2022) ^[6] and Reddy *et al.* (2023) ^[12].

3.5. Drymatter production (kg ha⁻¹)

Drymatter production was not significantly affected by the herbicide ready-mix treatments at 20 DAS, although the weed-free check (T₉) showed comparatively greater biomass accumulation. The lack of significant differences during the initial growth stage may be due to lower weed pressure and the fact that post-emergence ready-mix herbicides had not yet applied. In

contrast, significant differences in dry matter production were evident at 60 DAS. The highest dry matter accumulation was recorded under the weed-free check (T₉), while among the herbicide treatments, fomesafen 16.8% + propaquizafop 5.2% ME produced the greatest biomass. This was subsequently followed by post-emergence applications of fomesafen 12.5% + quizalofop-P-ethyl 4.68% ME (T₃), fomesafen 11.1% + fluazifop-P-butyl 11.1% ME (T₄), imazethapyr 35% + imazamox 35% WG (T₈) and quizalofop-ethyl 7.5% + imazethapyr 15% EC (T₇), which were statistically comparable with each other in descending order. The higher dry matter production under these treatments may be attributed to efficient weed control, which reduced competition for growth resources and enabled better crop growth, resulting in greater biomass accumulation (Shashidhar *et al.*, 2020 and Ramesh *et al.*, 2020) ^[15, 11]. The weedy check (T₁₀) recorded the lowest dry matter production, indicating the adverse effect of unchecked weed growth on crop development (Meena *et al.*, 2020) ^[9].

Table 1: Growth parameters of rice-fallow blackgram as influenced by various herbicide ready-mix combinations

Treatments	Plant height (cm)		No. of branches (no. plant ⁻¹)		No. of nodules (no. plant ⁻¹)		Drymatter production (kg ha ⁻¹)		Leaf area index (%)	
	20 DAS	60 DAS	20 DAS	60 DAS	20 DAS	60 DAS	20 DAS	60 DAS	20 DAS	60 DAS
T ₁	12.80	20.28	1.42	3.58	5.77	7.93	185.3	1231	0.48	3.78
T ₂	10.50	21.68	1.24	3.82	5.30	8.26	178.1	1469	0.46	3.93
T ₃	10.00	29.63	1.15	5.25	4.97	9.45	175.2	1715	0.43	4.64
T ₄	10.10	28.97	1.16	5.25	5.07	9.01	172.6	1741	0.44	4.38
T ₅	10.60	33.42	1.34	6.06	5.40	9.59	188.5	1974	0.47	4.07
T ₆	10.40	20.69	1.26	3.54	5.27	8.09	186.9	1296	0.46	3.86
T ₇	10.20	22.91	1.19	3.84	5.17	8.26	180.2	1542	0.45	3.78
T ₈	10.30	26.04	1.24	4.78	5.20	9.39	182.7	1648	0.45	4.18
T ₉	14.50	37.51	1.45	7.00	6.43	10.00	194.8	2263	0.49	4.90
T ₁₀	11.00	16.47	1.36	2.22	5.50	7.50	170.9	857	0.47	3.33
S. Em (±)	0.47	1.20	0.07	0.21	0.27	0.48	7.3	69	0.02	0.15
CD (p=0.05)	NS	3.57	NS	0.62	NS	1.42	NS	207	NS	0.45

4. Conclusion

The study revealed that the herbicide ready-mix treatments did not markedly influence the growth parameters of rice-fallow blackgram during the initial stage of crop growth (20 DAS). However, clear treatment effects became evident at 60 DAS, where significant improvements in plant height, branching, nodulation, leaf area index and dry matter production were observed under effective weed management practices. Among the herbicide ready-mix treatments, post-emergence application of fomesafen 16.8% + propaquizafop 5.2% ME (T₅) consistently exhibited better growth performance and this was followed by the application of fomesafen 12.5% + quizalofop-P-ethyl 4.68% ME (T₃), fomesafen 11.1% + fluazifop-P-butyl 11.1% ME (T₄). The favourable response under these treatments may be attributed to effective weed suppression, which minimized crop-weed competition and ensured better utilization of available resources such as nutrients, moisture and light. While the weed-free check (T₉), recorded the highest values for all growth parameters, fomesafen 16.8% + propaquizafop 5.2% ME (T₅), proved to be the most promising herbicide ready-mix among the tested treatments for improving crop growth and biomass production. However, the weedy check recorded the poor growth performance owing to its continuous weed interference throughout the crop growth period.

References

1. Das S, Ray M, Roy AS, Barat S. Weed diversity and their management in major rice-based cropping systems in India.

International Journal of Bio-Resource and Stress Management. 2024;15(7):1-9.

2. Dhayal S, Yadav SL, Ram B, Sharma A. Effect of herbicides on associated weeds and growth of blackgram. Indian Journal of Weed Science. 2022;54(2):203-207.
3. Harisha S, Seenappa C, Lalitha BS, Raddy G, Pandu U. Bio-efficacy of new post-emergent herbicides on growth and yield of blackgram. Indian Journal of Weed Science. 2021;53(1):107-110.
4. Jain LK, Jain A. Efficacy of herbicides on weed parameters and yield of greengram [*Vigna radiata* Wilczek]. Indian Journal of Agronomy. 2025;70(1):99-104.
5. Kumar A, Kumari R, Singh S, Kumar P. Weed management in summer-sown blackgram (*Vigna mungo* L.) through sequential application of pre- and post-emergence herbicides: a review. Legume Research. 2025;48(5):725-733.
6. Kumar B, Kumar N, Sirisha L, Paswan D, Kumar S. Bio-efficacy of pre- and post-emergence herbicides on lentil yield, weed control efficiency, weed index, nutrient uptake and economics. Pharma Innovation Journal. 2022;8(11):1708-1712.
7. Maji S, Biswas P, Paul A, Paul A, Mondal A, Mondal S. Comparative efficacy of herbicide mixtures for efficient weed management and productivity enhancement of pre-kharif greengram. Indian Journal of Weed Science. 2025;57(2):193-200.
8. Manohar B, Ray P, Singh R, Kumar S, Ghosh M. Efficacy of pre- and post-emergence herbicides on weed flora and

- nutrient uptake by weeds and blackgram. *Indian Journal of Weed Science*. 2024;56(2):114-118.
9. Meena BL, Meena DS, Ram B, Sharma MK, Gautam C, Nagar G. Effect of herbicidal weed control on growth and yield of soybean. *International Journal of Current Microbiology and Applied Sciences*. 2020;9(10):2880-2884. doi:10.20546/ijcmas.2020.910.347.
 10. Mudalagiriappa, Thimmegowda MN, Hanumanthappa DC, Ningoji SN, Sannappanavar S. Evaluation of weed management efficacy of post-emergence herbicides in blackgram under semi-arid Alfisols. *Indian Journal of Weed Science*. 2022;54(2):174-181.
 11. Ramesh T, Rathika S. Management of *Trianthema portulacastrum* through herbicides in greengram. *Indian Journal of Weed Science*. 2020;52(3):286-289.
 12. Reddy NRM, Subramanyam D, Sumathi V, Sagar GK. Weed management in blackgram with pre- and post-emergence herbicides. *Indian Journal of Weed Science*. 2023;55(4):461-463.
 13. Shankar KS, Vanaja M, Shankar M, Siddiqua A, Sharma KL, Girijaveni V, *et al.* Change in mineral composition and cooking quality in legumes grown on semi-arid Alfisols due to elevated CO₂ and temperature. *Frontiers in Nutrition*. 2025;11:1444962.
 14. Shashidhar KS, Jeberson MS, Premaradhya N, Priyanka I, Vinoda KS. Effect of different pre- and post-emergent application of herbicides on the productivity of blackgram (*Vigna mungo* L.) under acidic soils of Manipur. *Journal of Current Opinion in Crop Science*. 2020;1(1):21-26.
 15. Shashidhar KS, Jeberson S, Premaradhya M, Singh NAK, Bhuvaneswari S. Weed management effect in blackgram under acidic soils of Manipur. *Indian Journal of Weed Science*. 2020;52(2):147-152.
 16. Singh V, Khan N, Gupta SP, Kumar A. Impact of pre- and post-emergence herbicide combinations on the yield of black gram. *Biological Forum – An International Journal*. 2022;14(2):1398-1401.
 17. Susmitha M, Vijaya Bhaskar Reddy U, Ramesh Babu PV, Srinivasa Reddy M. Efficacy of different herbicides on weed dynamics and yield attributes in kharif blackgram [*Vigna mungo* (L.)]. *International Journal of Current Microbiology and Applied Sciences*. 2019;8(6):2026-2031.
 18. Watson DJ. The physiological basis of variation in yield. *Advances in Agronomy*. 1952;4:101-145.