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Effect of sole or sequential application of herbicides on weeds, and productivity of *Rabi* Blackgram at Southern Telangana Zone

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Abstract
An agronomic investigation was carried out during the *rabi* season of 2024-25 at the College Farm, Agricultural College, Palem, Nagarkurnool district, to evaluate the performance of different herbicide options applied either singly or in sequence at pre-, early-post, and post-emergence stages in blackgram. The trial was laid out in a randomized block design with thirteen treatments and three replications. The treatments included sole applications as well as sequential use of pendimethalin 38.7% CS (677.25 g a.i. ha^{-1}), diclosulam 84% WDG (20 g a.i. ha^{-1}), pendimethalin 30% + imazethapyr 2% EC (1000 g a.i. ha^{-1}), fluazifop-p-butyl 11.1% + fomesafen 11.1% SL (250 g a.i. ha^{-1}), and propaquizafop 2.5% + imazethapyr 3.75% ME (50 + 75 g a.i. ha^{-1}). Among these, sequential application of pendimethalin + imazethapyr (PE) followed by either fluazifop-p-butyl + fomesafen or propaquizafop + imazethapyr (PoE) at 20-25 DAS effectively suppressed weed density and biomass, which resulted in superior seed yield.

Keywords: Blackgram, herbicide mixtures, sequential spraying, weed control efficiency, yield

Introduction
Blackgram (*Vigna mungo* L.) is an important pulse crop in India that contributes significantly to food security and soil fertility. Being a short-duration crop, it fits well in different seasons such as *kharif*, *rabi*, and summer. In 2023-24, blackgram occupied nearly 35.35 lakh hectares in the country with a production of 23.18 lakh tonnes and an average productivity of 656 kg ha^{-1}. Telangana, however, reported a much higher productivity of 1233 kg ha^{-1} from an area of about 0.30 lakh hectares (Indiastat, 2023-24) [3]. One of the major production constraints in blackgram is weed competition, particularly during the initial growth stages, when weeds compete strongly for water, nutrients, light, and space. Such competition is most critical between 17 and 50 days after sowing, and yield losses can range from 20% to 70% depending on the region and weed flora (Saravanane *et al*., 2020; Sreekanth *et al*., 2024; Reddy *et al*., 2023) [8, 9, 7]. Labor scarcity and high weeding costs further aggravate the problem, making manual weeding less feasible.
Chemical control has therefore become a practical approach, but continuous use of single-spectrum herbicides often fails to provide effective control of diverse weed populations (Nath *et al*., 2018) [5]. Even pendimethalin, widely used as a pre-emergence option, shows reduced effectiveness on certain species (Naveen *et al*., 2019) [6]. Thus, integrating herbicides with broader activity and safer residual effects is essential. Sequential application of pre- and post-emergence herbicides has been shown to be more reliable than manual weeding alone (Marimuthu *et al*., 2016) [4]. Similarly, tank-mix or ready-mix formulations improve the spectrum of weed control and delay resistance development (Banerjee *et al*., 2018) [1]. Hence, identifying effective combinations that suppress weeds while maintaining blackgram yield remains a key research priority

Materials and methods
A field experiment was undertaken during *rabi* 2024-25 at the College Farm, Agricultural College, Palem (Nagarkurnool district, Telangana). The experimental soil was sandy loam in texture, slightly acidic in reaction, with low organic carbon (0.36%) and available nitrogen (220

kg ha^{-1}), medium phosphorus (48 kg ha^{-1}), and high potassium (328 kg ha^{-1}). The trial consisted of thirteen weed management practices; each replicated three times in a randomized block design. The treatments were T_1- pendimethalin 38.7% CS @ 677.25 g a.i. ha^{-1} (PE) *fb* hand weeding at 20-25 DAS, T_2- diclosulam 84% WDG @20 g a.i. ha^{-1} (PE), T_3- pendimethalin 30%+ imazethapyr 2% EC @ 1000 g a.i. ha^{-1} (Ready Mix) (PE), T_4- fluazifop-p-butyl 11.1% w/w + fomesafen 11.1% w/w SL @ 250 g a.i. ha^{-1} (Ready Mix) (Early PoE) at 12-15 DAS, T_5- propaquizafop 2.5% + imazethapyr 3.75% w/w ME @ 50+75 g a.i. ha^{-1} (Ready Mix) (Early PoE) at 12-15 DAS, T_6- pendimethalin 38.7% CS @ 677.25 g a.i. ha^{-1} (PE) *fb* fluazifop-p-butyl 11.1% w/w + fomesafen 11.1% w/w SL @ 250 g a.i. ha^{-1} (Ready Mix) (PoE) at 20-25 DAS, T_7- pendimethalin 38.7% CS @ 677.25 g a.i. ha^{-1} (PE) *fb* propaquizafop 2.5% + imazethapyr 3.75% w/w ME @ 50+75 g a.i. ha^{-1} (Ready Mix) (PoE) at 20-25 DAS, T_8- T_2 *fb* fluazifop-p-butyl 11.1% w/w + fomesafen 11.1% w/w SL @ 250 g a.i. ha^{-1} (Ready Mix) (PoE) at 20-25 DAS, T_9- T_2 *fb* propaquizafop 2.5% + imazethapyr 3.75% w/w ME @ 50+75 g a.i. ha^{-1} (Ready Mix) (PoE) at 20-25 DAS, T_{10}-T_3 *fb* fluazifop-p-butyl 11.1% w/w + fomesafen 11.1% w/w SL @ 250 g a.i. ha^{-1} (Ready Mix) (PoE) at 20-25 DAS, T_{11}- T_3 *fb* propaquizafop 2.5% + imazethapyr 3.75% w/w ME @ 50+75 g a.i. ha^{-1} (Ready Mix) (PoE) at 20-25 DAS, T_{12}- weed-free check (Hand Weeding at 20 & 40 DAS) and T_{13}- weedy check. Pre-emergence sprays were applied at 1 DAS, early post-emergence at 12 DAS, and post-emergence at 20 DAS using a knapsack sprayer fitted with a flat-fan nozzle, calibrated to deliver 500 L ha^{-1}. The blackgram variety *MBG 1070* was sown at 30 × 10 cm spacing, and recommended agronomic practices were followed uniformly across plots.

Weed density and dry matter were recorded at 45 DAS. Observations on grasses, broad-leaved weeds, sedges, and total weed population were expressed as number m^{-2} and dry weight in g m^{-2} after square root transformation. Seed and haulm yields were recorded at maturity, and harvest index was calculated as the ratio of economic to biological yield. Statistical analysis of data was carried out following the procedures suggested by Gomez and Gomez (1984) [2].

Results and discussion

Effect on weeds: The predominant weed flora recorded in the experimental field included *Echinochloa colona*, *Digitaria sanguinalis* and *Dactyloctenium aegyptium* among grasses; *Digera arvensis*, *Parthenium hysterophorus*, *Boerhavia hispida*, *Portulaca oleracea*, and *Trianthema portulacastrum* among broad-leaved weeds; and *Cyperus rotundus* among sedges.

All herbicide-based treatments significantly reduced weed population and biomass at 45 DAS compared with the weedy check (Table 1). The lowest weed density and dry weight were observed under the weed-free check (T_{12}), which was statistically comparable with sequential applications involving pendimethalin + imazethapyr (PE) followed by either fluazifop-p-butyl + fomesafen (PoE) (T_{10}) or propaquizafop + imazethapyr (PoE) (T_{11}). The enhanced effectiveness of these combinations could be attributed to the initial suppression of germination by pendimethalin + imazethapyr, supplemented by the broad-spectrum activity of post-emergence mixtures offering dual modes of action.

Effect on productivity

Seed yield, haulm yield, and harvest index of blackgram were markedly influenced by different weed management practices (Table 2). The highest seed yield was obtained from the weed-free check (1232 kg ha^{-1}), which remained at par with T_{10} (1181 kg ha^{-1}), T_{11} (1036 kg ha^{-1}), and T_1 (1003 kg ha^{-1}). Similar trends were noted for haulm yield, where T_{12} produced the maximum biomass (2126 kg ha^{-1}), followed closely by T_{10}, T_{11}, and T_1.

The harvest index also showed improvement under effective sequential applications. Weed-free plots registered the highest harvest index (36.63%), which was statistically on par with T_{10} (36.17%). These outcomes suggest that maintaining a weed-free environment during the crop's critical growth phases promoted better partitioning of assimilates into economic yield. The sequential application of pre- and post-emergence herbicides provided prolonged weed suppression and reduced competition, thereby supporting higher productivity.

Yield reductions were most pronounced in the weedy check, which recorded 66.31% and 42.63% lower seed and haulm yield, respectively, compared to the weed-free control. Comparable findings have been documented in earlier studies on blackgram and greengram (Dhayal *et al*., 2024; Udhaya *et al*., 2023) [11, 12].

Table 1: Effect of sole or sequential application of herbicides on weed density and weed dry weight (g m^{-2}) in *rabi* blackgram at 45 DAS

Treatments	Weed density (No. m^{-2})				Weed dry weight (g m^{-2})			
	Grasses	BLW	Sedges	Total	Grasses	BLW	Sedges	Total
T_1	1.05 (0.67)	1.90 (3.33)	4.18 (17.00)	4.64 (21.00)	1.00 (0.55)	1.63 (2.26)	3.68 (13.09)	4.05 (15.90)
T_2	1.34 (1.33)	1.22 (1.00)	4.91 (23.67)	5.15 (26.00)	1.22 (1.00)	1.12 (0.76)	4.41 (18.93)	4.60 (20.69)
T_3	1.22 (1.00)	4.30 (18.00)	6.35 (40.00)	7.70 (59.00)	1.13 (0.78)	3.48 (11.62)	5.65 (31.60)	6.66 (44.00)
T_4	1.22 (1.00)	1.87 (3.00)	5.30 (28.00)	5.67 (32.00)	1.13 (0.78)	1.58 (2.01)	4.84 (23.24)	5.12 (26.03)
T_5	1.05 (0.67)	3.32 (10.67)	6.11 (37.33)	6.97 (48.67)	1.00 (0.54)	2.76 (7.18)	5.60 (31.36)	6.26 (39.08)
T_6	1.22 (1.00)	1.56 (2.00)	6.12 (37.00)	6.36 (40.00)	1.14 (0.79)	1.30 (1.24)	4.48 (19.61)	4.71 (21.64)
T_7	1.22 (1.00)	4.02 (15.67)	6.20 (38.33)	7.43 (55.00)	1.14 (0.80)	3.18 (9.64)	5.58 (31.05)	6.46 (41.49)
T_8	1.22 (1.00)	0.71 (0.00)	4.18 (17.00)	4.30 (18.00)	1.12 (0.76)	0.71 (0.00)	3.71 (13.26)	3.81 (14.02)
T_9	1.22 (1.00)	1.05 (0.67)	4.22 (17.33)	4.41 (19.00)	1.13 (0.78)	0.99 (0.53)	3.88 (14.56)	4.04 (15.87)
T_{10}	0.71 (0.00)	0.71 (0.00)	4.07 (16.33)	4.07 (16.33)	0.71 (0.00)	0.71 (0.00)	3.14 (9.47)	3.14 (9.47)
T_{11}	0.71 (0.00)	1.86 (3.00)	4.37 (18.67)	4.70 (21.67)	0.71 (0.00)	1.49 (1.74)	3.49 (11.76)	3.73 (13.50)
T_{12}	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)
T_{13}	5.64 (31.33)	9.19 (84.33)	9.48 (90.00)	14.34(205.67)	4.71 (21.70)	6.99 (48.60)	8.84 (78.30)	12.19 (148.60)
SEm±	0.09	0.19	0.31	0.29	0.08	0.16	0.28	0.26
CD (P=0.05)	0.26	0.56	0.91	0.86	0.22	0.46	0.82	0.77

* Figures in parenthesis indicate original values and were transformed to ($\sqrt{X + 0.5}$) values

Table 2: Effect of sole or sequential application of herbicides on seed yield, haulm yield and harvest index (%) in *rabi* blackgram

Treatments	Seed yield (kg ha^{-1})	Haulm yield (kg ha^{-1})	Harvest index (%)
T_1	1003	2043	32.93
T_2	588	1566	27.10
T_3	882	1792	32.93
T_4	899	1817	33.05
T_5	882	1799	32.82
T_6	961	1954	32.96
T_7	949	1857	33.78
T_8	695	1761	28.09
T_9	667	1714	27.70
T_{10}	1181	2081	36.17
T_{11}	1036	2051	33.11
T_{12}	1232	2126	36.63
T_{13}	415	1219	25.13
SEm±	83	29	2.27
CD (P=0.05)	241	85	6.63

Conclusion

The study demonstrated that sequential application of herbicide mixtures was more effective than sole applications in managing weeds in *rabi* blackgram. Among the tested treatments, pendimethalin + imazethapyr (PE) followed by either fluazifop-p-butyl + fomesafen (PoE) (T_{10}) or propaquizafop + imazethapyr (PoE) (T_{11}) provided excellent suppression of grasses, broad-leaved weeds, and sedges, resulting in yields comparable to the weed-free check. These combinations ensured season-long weed control, minimized yield losses, and created a favorable crop environment during critical stages of weed competition.

Thus, sequential herbicide use, particularly T_{10} and T_{11}, can be recommended as efficient and practical weed management strategies for enhancing productivity of *rabi* blackgram under Southern Telangana conditions.

Reference

1. Banerjee H, Das T, Ray K, Laha A, Sarkar S, Pal S. Herbicide ready mixes effect on weed control efficacy, nontarget and residual toxicities, productivity and profitability in sugarcane-greengram cropping system. Int J Pest Manag. 2018;64(3):221-229.
2. Gomez K, Gomez A. Statistical procedure for agricultural research. Manila (PH): International Rice Research Institute; 1984. p. 304-305.
3. Indiastat. Area, production and productivity of blackgram in India [Internet]. 2023-2024 [cited 2025 Sep 15]. https://www.indiastat.com/
4. Marimuthu S, Venkataraman N, Sanbagavalli S. Weed management practices on weed control efficiency and yield of blackgram. Int J Adv Res. 2016;4(12):965-969.
5. Nath C, Dubey R, Sharma A, Hazra K, Kumar N, Singh S, *et al*. Evaluation of new generation post-emergence herbicides in chickpea (*Cicer arietinum* L.). Natl Acad Sci Lett. 2018;41(1):1-5.
6. Naveen K, Subramanyam D, Nagavani A, Umamahesh V. Weed management in groundnut with high efficiency herbicides. Indian J Weed Sci. 2019;51(3):306-307.
7. Reddy N, Subramanyam D, Sumathi V, Sagar G. Weed management in blackgram with pre- and post-emergence herbicides. Indian J Weed Sci. 2023;55(4):461-463.
8. Saravanane P, Poonguzhalan R, Vijayakumar S, Pooja K. Crop-weed competition in blackgram in coastal deltaic ecosystem. Indian J Weed Sci. 2020;52(3):283-285.
9. Sreekanth G, Rani B, Reddy P, Prasanthi A, Chandrika V, Sagar G, *et al*. Effect of pre- and post-emergence herbicides on weed growth and yield of blackgram (*Vigna mungo* L.). Andhra Pradesh J Agric Sci. 2024;10(1):20-25.
10. Teja K, Duary B, Mandal S, Dash S, Mallick R, Kumar M, *et al*. Chemical weed management in kharif blackgram under lateritic soil of West Bengal, India. Ecol Environ Conserv. 2017;23(2):1032-1036.
11. Dhayal KS, Forgenie D, Giri AK, Khoiriyah N, Isaac WA. Modelling the nexus between green energy, agricultural production, forest cover, and population growth towards climate change for the transition towards a green economy. Environment, Development and Sustainability. 2024 Sep 9:1-25.
12. Madhavi S, Praveen R, Jagadish Kumar N, Udhaya Sankar SM. Hybrid Grey PIPRECIA and Grey OCRA method-based dynamic multi-criteria decision-making model for mitigating non-cooperating node attacks in WSNs. Peer-to-Peer Networking and Applications. 2023 Sep;16(5):2607-29.