Andhra Pradesh J Agril. Sci : 10(1): 20-25, 2024

EFFECT OF PRE AND POST EMERGENCE HERBICIDES ON WEED GROWTH AND YIELD OF BLACKGRAM (*Vigna mungo* L.)

G. SREEKANTH*, B. SANDHYA RANI, P. MAHESWARA REDDY, A. PRASANTHI, V. CHANDRIKA AND G. KARUNA SAGAR

Department of Agronomy, S.V. Agricultural College, ANGRAU, Tirupati-517 502.

Date of Receipt: 04-01-2024 Date of Acceptance: 05-03-2024

ABSTRACT

A field experiment entitled "Bio-efficacy of pre and post emergence herbicides on weed dynamics and productivity of blackgram (*Vigna mungo* L.)" was conducted at Wetland Farm, S.V. Agricultural College, Tirupati campus of Acharya N.G. Ranga Agricultural University, Andhra Pradesh, India during *rabi,* 2022-23 to identify the economically feasible weed management practice for broad-spectrum weed control and enhancing productivity of blackgram. The experiment was laid out in a randomized block design with nine weed management practices and replicated thrice. The treatments consisted of PE application of diclosulam 20 g ha^{-1} + 1 HW at 15 DAS (T_1), PoE application of imazethapyr 50 g ha^{-1} at 20 DAS (T_2), PoE application of quizalofop-p-ethyl + imazethapyr 98 g ha^{-1} at 20 DAS (T3), PoE application of imazethapyr + imazamox 70 g ha^{-1} at 20 DAS (T_4), PoE application of propaquizafop + imazethapyr 125 g ha^{-1} at 20 DAS (T_5), PoE application of sodium acifluorfen + clodinafop propargyl 245 g ha^{-1} at 20 DAS (T_6), PoE application of fluazifop-p-butyl + fomesafen 222 g ha^{-1} at 20 DAS (T_7), Hand weeding twice at 15 and 30 DAS (T_8) and Weedy check (T_9). Results revealed that among all the treatments higher yield and lowest weed growth was achieved with hand weeding twice at 15 and 30 DAS (T_8) which was at par with PoE application of fluazifop-p-butyl + fomesafen 222 g ha^{-1} at 20 DAS (T_7) and PoE application of sodium acifluorfen + clodinafop propargyl 245 g ha^{-1} at 20 DAS (T_6).

KEYWORDS: Blackgram, Broad-spectrum, Economically-feasible, Pre and Post emergence herbicides.

INTRODUCTION

Blackgram (*Vigna mungo* L.) also known as urdbean, mash, mungbean, black mapte *etc.,* is an important short duration pulse crop grown in many parts of India. It is consumed in a variety of ways across from north to south in preparation of popular dishes like vada, idli, dosa and halwa *etc.,* in combination with other food grains. Blackgram is also used as nutritive fodder especially for milch animals. Weed management is an important aspect of blackgram cultivation to ensure optimal crop growth and yield. Different categories of weeds *i.e.,* grasses, sedges and broadleaved weeds compete combinedly or individually with blackgram for various growth factors like nutrients, water, and sunlight and reduce yield considerably (Choudhary *et al.,* 2012). Most of the high yielding varieties under cultivation are short-statured, compact and resistant to yellow mosaic virus. Weed infestation in short-statured dwarf varieties like TBG-104 and PU-31 is very high due to their slow initial growth and dwarf stature. In addition, weeds provide habitat for various pests and act as alternate host plants for viruses.

In recent years many new herbicide molecules have been synthesized with a higher weed control efficiency even at a lower dose, shorter half-life and low mammalian toxicity. These herbicides are broad spectrum in nature with a wider window of application and with an environmental advantage deriving from their very low application rates in grams rather than in kg ha^{-1} which markedly reduce the chemical load in the environment.

MATERIAL AND METHODS

Field experiment entitled "Bio-efficacy of pre and post emergence herbicides on weed dynamics and productivity of blackgram (*Vigna mungo* L.)" was conducted at Wetland Farm, S.V. Agricultural College, Tirupati campus of Acharya N.G. Ranga Agricultural University, Andhra Pradesh, India during *rabi,* 2022-23. The soil was sandy loam in texture, neutral in reaction, low in organic carbon and available nitrogen, medium in available phosphorus and available potassium. The experiment was laidout in a randomized block design with nine treatments and replicated thrice. The treatments consisted of PE application of diclosulam 20 g ha^{-1} + 1 HW at 15 DAS (T_1), PoE application of

*Corresponding author, E-mail: gollasreekanth42@gmail.com

imazethapyr 50 g ha^{-1} at 20 DAS (T_2), PoE application of quizalofop-p-ethyl + imazethapyr 98 g ha^{-1} at 20 DAS (T_3), PoE application of imazethapyr + imazamox 70 g ha^{-1} at 20 DAS (T_4), PoE application of propaquizafop + imazethapyr 125 g ha^{-1} at 20 DAS (T_5), PoE application of sodium acifluorfen + clodinafop propargyl 245 g ha^{-1} at 20 DAS (T_6), PoE application of fluazifop-p-butyl + fomesafen 222 g ha^{-1} at 20 DAS (T_7), Hand weeding twice at 15 and 30 DAS (T_8) and weedy check (T_9). The test variety used in the present experiment was TBG-104 (Tirupati blackgram 104) with a spacing of 30 cm x 10 cm. The recommended dose of 20 kg N, 40 kg P_2O_5 and 20 kg K_2O ha^{-1} was applied in the form of urea, single super phosphate and muriate of potash respectively to all the plots. Entire dose of nitrogen and phosphorous was applied as basal. Pre emergence herbicide was applied within 24 hours after sowing and early post-emergence herbicides were applied at 20 DAS. Weed population was counted with the help of 0.5 x 0.5 m quadrant thrown randomly at two places in each plot and expressed as population or density m^{-2}. While recording weed density, weeds were harvested from each of the quadrat for estimating the weed biomass. Different weed species collected for assessing the density of weeds were dried separately in a hot air oven at 65ºC till constant dry weight was reached and expressed as weed biomass (g m^{-2}). Five randomly selected blackgram plants were tagged in each treatment, from each replication in the net plot area and used for making observations on yield attributes. Due to large variation in values of weed density and biomass, the corresponding data was subjected to square root transformation $(\sqrt{x + 0.5})$ and the corresponding transformed values were used for statistical analysis as suggested by Gomez and Gomez (1984).

The data recorded during the investigation was statistically analyzed following the analysis of variance for RBD design as suggested by Panse and Sukhatme (1985). Statistical significance was tested with 'F' value at five per cent level of probability.

RESULTS AND DISCUSSION

Weed flora

The weed flora associated with blackgram belonged to thirteen taxonomic families, of which the predominant weed species noticed in the experimental field were *Dactyloctenium aegyptium* and *Digitaria sanguinalis* among grasses, *Cyperus rotundus* a sedge, *Boerhavia erecta*, *Commelina benghalensis* and *Euphorbia hirta* among the broadleaved weeds.

Weed density and biomass

At harvest of blackgram, post emergence application of fluazifop-p-butyl + fomesafen 222 g ha^{-1} (T_7) registered significantly lower density of grasses, however which was comparable with pre emergence application of diclosulam 20 g ha^{-1} + 1 HW at 15 DAS (T_1), hand weeding twice at 15 and 30 DAS (T_8) and post emergence application of sodium acifluorfen + clodinafop propargyl 245 g ha^{-1} (T_6). Among the different ready-mix herbicides tried fop + fen combination was most effective in controlling the density of grasses, which might be due to translocation of herbicide to every part of plant through leaves and roots leading to complete destruction of weeds. Sedge count was significantly lower with pre emergence application of diclosulam 20 g ha^{-1} + 1 HW at 15 DAS (T_1) however it was comparable with post emergence application of imazethapyr + imazamox 70 g ha^{-1} (T_4), hand weeding twice at 15 and 30 DAS (T_8) and post emergence application of imazethapyr 50 g ha^{-1} (T_2). Among the different weed management practices tried, density of broadleaved weeds was significantly lower with pre emergence application of diclosulam 20 g ha^{-1} + 1 HW at 15 DAS (T_1) which was comparable with post emergence application of fluazifop-p-butyl + fomesafen 222 g ha^{-1} (T_7), hand weeding twice at 15 and 30 DAS (T_8) and post emergence application of sodium acifluorfen + clodinafop propargyl 245 g ha^{-1} (T_6). The total weed population at harvest was significantly lower with pre emergence application of diclosulam 20 g ha^{-1} + 1 HW at 15 DAS (T_1) which was however at par with hand weeding twice at 15 and 30 DAS (T_8), post emergence application of fluazifop- p-butyl + fomesafen 222 g ha^{-1} (T_7) and post emergence application of sodium acifluorfen + clodinafop propargyl 245 g ha^{-1} (T_6). Pre emergence application of diclosulam followed by one hand weeding at 15 DAS (or) hand weeding twice (or) ready mix combination of fop and fen group were effective in reducing the density of total weeds. Similar views were also endorsed by Tamang *et al*. (2015).

Among the weed management practices investigated, pre emergence application of diclosulam 20 g ha^{-1} + 1 HW at 15 DAS (T_1) resulted in lower dry weight of grasses, however it was comparable with post emergence application of fluazifop-p-butyl + fomesafen 222 g ha^{-1} (T_7), hand weeding twice at 15 and 30 DAS (T_8) and post emergence application of sodium acifluorfen + clodinafop propargyl 245 g ha^{-1} (T_6). The dry weight of sedges was

Table 1. Weed density (No. m^{-2}) at harvest of blackgram as influenced by weed management practices

Treatments	Grasses	Sedges	BLW	Total
T_1 : PE application of diclosulam 20 g ha^{-1} + 1 HW at 15 DAS	6.57 (42.67)	6.48 (41.67)	6.28 (39.00)	11.13 (123.34)
T_2 : PoE application of imazethapyr 50 g ha^{-1} at 20 DAS	9.04 (81.33)	7.06 (49.67)	8.14 (66.00)	14.03 (197.00)
T_3 : PoE application of quizalofop- p- ethyl + imazethapyr 98 g ha^{-1} at 20 DAS	7.97 (63.00)	7.92 (62.67)	8.07 (64.67)	13.80 (190.34)
T_4 : PoE application of imazethapyr + imazamox 70 g *a.i.* ha^{-1} at 20 DAS	9.40 (88.00)	6.72 (44.67)	8.32 (69.00)	14.22 (201.67)
T_5 : PoE application of propaquizafop + imazethapyr 125 g ha^{-1} at 20 DAS	7.87 (61.67)	7.80 (60.33)	7.80 (60.33)	13.52 (182.33)
T_6 : PoE application of sodium aciflourofen + clodinafop propargyl 245 g ha^{-1} at 20 DAS	6.89 (47.00)	8.03 (64.00)	6.87 (46.67)	12.58 (157.67)
T_7 : PoE application of fluazifop-p-butyl + fomesafen 222 g ha^{-1} at 20 DAS	6.45 (41.33)	8.21 (67.00)	6.44 (41.00)	12.24 (149.33)
T_8 : Hand Weeding twice at 15 and 30 DAS	6.66 (44.00)	6.84 (46.33)	6.71 (44.67)	11.63 (135.00)
T_9 : Weedy check (Control)	10.66 (113.67)	10.54 (110.67)	10.41 (108.33)	18.24 (332.67)
SEm ±	0.275	0.241	0.295	0.295
CD (P=0.05)	0.82	0.72	0.88	0.88

Data in parentheses are original values, which were square root transformed and analysed statistically

Table 2. Weed dry weight (g m^{-2}) at harvest of blackgram as influenced by weed management practices

Treatments	Grasses	Sedges	BLW	Total
T_1 : PE application of diclosulam 20 g ha^{-1} + 1 HW at 15 DAS	4.14 (16.60)	4.16 (16.77)	3.98 (15.43)	7.02 (48.80)
T_2 : PoE application of imazethapyr 50 g ha^{-1} at 20 DAS	5.57 (30.67)	4.50 (19.87)	5.76 (32.73)	9.15 (83.27)
T_3 : PoE application of quizalofop- p- ethyl + imazethapyr 98 g ha^{-1} at 20 DAS	5.43 (28.97)	5.14 (25.97)	5.60 (31.00)	9.30 (85.94)
T_4 : PoE application of imazethapyr + imazamox 70 g *a.i.* ha^{-1} at 20 DAS	5.71 (32.47)	4.28 (17.90)	5.87 (34.00)	9.21 (84.37)
T_5 : PoE application of propaquizafop + imazethapyr 125 g ha^{-1} at 20 DAS	5.16 (26.17)	4.99 (24.47)	5.51 (30.00)	9.01 (80.64)
T_6 : PoE application of sodium aciflourofen + clodinafop propargyl 245 g ha^{-1} at 20 DAS	4.64 (21.20)	5.16 (26.17)	4.41 (19.00)	8.18 (66.37)
T_7 : PoE application of fluazifop-p-butyl + fomesafen 222 g ha^{-1} at 20 DAS	4.51 (20.13)	4.81 (22.60)	4.12 (16.47)	7.71 (59.20)
T_8 : Hand Weeding twice at 15 and 30 DAS	4.55 (20.47)	4.37 (18.63)	4.39 (18.80)	7.63 (57.9)
T_9 : Weedy check (Control)	7.17 (50.77)	7.26 (52.23)	7.68 (58.57)	12.73 (161.57)
SEm ±	0.168	0.147	0.144	0.210
CD (P=0.05)	0.50	0.44	0.43	0.63

Data in parentheses are original values, which were square root transformed and analysed statistically

Table 3. Yield attributes, seed and haulm yield (kg ha^{-1}) of blackgram as influenced by different weed management practices

Treatments	Number of filled pods plant^{-1}	Number of seeds pod^{-1}	Seed yield	Haulm yield
T_1 : PE application of diclosulam 20 g ha^{-1} + 1 HW at 15 DAS	9.1	4.0	527	1021
T_2 : PoE application of imazethapyr 50 g ha^{-1} at 20 DAS	9.2	4.1	575	1075
T_3 : PoE application of quizalofop- p- ethyl + imazethapyr 98 g ha^{-1} at 20 DAS	11.6	5.9	836	1390
T_4 : PoE application of imazethapyr + imazamox 70 g *a.i.* ha^{-1} at 20 DAS	9.5	4.2	589	1132
T_5 : PoE application of propaquizafop + imazethapyr 125 g ha^{-1} at 20 DAS	12.2	6.0	840	1410
T_6 : PoE application of sodium aciflourofen + clodinafop propargyl 245 g ha^{-1} at 20 DAS	16.00	6.0	910	1410
T_7 : PoE application of fluazifop-p-butyl + fomesafen 222 g ha^{-1} at 20 DAS	16.5	6.2	957	1490
T_8 : Hand Weeding twice at 15 and 30 DAS	17.6	6.5	971	1501
T_9 : Weedy check (Control)	7.0	3.0	343	798
SEm ±	0.63	0.25	22.24	72.25
CD (P=0.05)	1.9	0.7	67	216

lower with pre emergence application of diclosulam 20 g ha^{-1} + HW at 15 DAS (T_1) which was comparable with post emergence application of imazethapyr + imazamox 70 g ha^{-1} (T_4), hand weeding twice at 15 and 30 DAS (T_8) and post emergence application of imazethapyr 50 g ha^{-1} (T_2). Imidazolinone group of herbicides are found effective in controlling of perennial sedge *Cyperus rotundus* by inhibiting ALS, a key enzyme responsible for biosynthesis of branched chain amino acids, as both imazethapyr and imazamox of this group reduced the emergence of *Cyperus rotundus* and recorded lower weed biomass. Dry weight of broadleaved weeds was lower with pre emergence application of diclosulam 20 g ha^{-1} + HW at 15 DAS (T_1), which was however comparable with post emergence application of fluazifop-p-butyl + fomesafen 222 g ha^{-1} (T_7), hand weeding twice at 15 and 30 DAS (T_8) and post emergence application of sodium acifluorfen + clodinafop propargyl 245 g ha^{-1} (T_6).

Pre emergence application of diclosulam 20 g ha^{-1} + 1 HW at 15 DAS (T_1) resulted in lower biomass of total weeds, but it was on par with hand weeding twice at 15 and 30 DAS (T_8) and the later was inturn on par with post emergence application of fluazifop-p-butyl + fomesafen 222 g ha^{-1} (T_7) and post emergence application of sodium acifluorfen + clodinafop propargyl 245 g ha^{-1} (T_6). Post emergence application of propaquizafop + imazethapyr 125 g ha^{-1} (T_5), post emergence application of imazethapyr 50 g ha^{-1} (T_2), post emergence application of imazethapyr + imazamox 70 g ha^{-1} (T_4) and post emergence application of quizalofop-p-etyl + imazethapyr 98 g ha^{-1} (T_3) which were at par with one another in the order of ascent whereas highest total weed density was recorded with weedy check (T_9).

Yield attributes and seed yield of blackgram

Higher number of filled pods plant^{-1} and number of seeds pod^{-1} of blackgram were registered with hand weeding twice at 15 and 30 DAS (T_8), which was at par with post emergence application of fluazifop-p-butyl + fomesafen 222 g ha^{-1} (T_7) and post emergence application of sodium acifluorfen + clodinafop propargyl 245 g ha^{-1} (T_6). The above two tratments facilitated with weed free environment for entire crop growth period and might have increased better utilization of growth resources for better pod development and filling. These findings are similar with Singh *et al.* (2014). Post emergence application of propaquizafop + imazethapyr 125 g ha^{-1} (T_5) was the next best, but it was at par with post emergence application of quizalofop-p-etyl + imazethapyr 98 g ha^{-1} (T_3). Yield attributes were significantly lower with weedy check (T_9) compared to rest of the weed management practices.

The highest seed and haulm yield and were realized with hand weeding twice at 15 and 30 DAS (T_8), which was at par with post emergence application of fluazifop-p-butyl + fomesafen 222 g ha^{-1} (T_7) and post emergence application of sodium acifluorfen + clodinafop propargyl 245 g ha^{-1} (T_6). Increase in seed yield in the above treatments might be due to reduced crop weed competition during the entire growing season, which inturn increased the availability of growth resources. (Chhokar and Balyan, 1999).

The next best treatment was post emergence application of propaquizafop + imazethapyr 125 g ha^{-1} (T_5), which was on par with post emergence application of quizalofop- p-etyl + imazethapyr 98 g ha^{-1} (T_3). Weedy check (T_9) resulted in lower seed and haulm yield when compared to all other treatments.

In conclusion the present study revealed that among the ready-mix herbicides post emergence application of fluazifop-p-butyl 11.1% SL + fomesafen11.1% SL 222 g ha^{-1} at 20 DAS resulted in higher seed and haulm yield apart from obtaining broad spectrum weed control in blackgram, which was however comparable with post emergence application of sodium acifluorfen 16.5% EC + clodinafop propargyl 8% EC 245 g ha^{-1} at 20 DAS. Hand weeding twice at 15 and 30 DAS realized higher seed and haulm yield but was not economical due to higher cost of cultivation.

LITERATURE CITED

Choudhary, V.K., Kumar, S.P and Bhagawati, R. 2012. Integrated weed management in blackgram (*Vigna mungo* L.) under mid hills of Arunachal Pradesh. *Indian Journal of Agronomy*. 57(4): 382-385.

Chhokar, R.S and Balyan, R.S. 1999. Competition and control of weeds in soybean. *Weed Science*. 47(1): 107-111.

Gomez, K.A and Gomez, A.A. 1984. Statistical Procedure for Agricultural Research. International Rice Research Institute, Manila, Philippines.

Singh, G., Aggarwal, N and Ram, H. 2014. Efficacy of post emergence herbicide imazethapyr for weed management in different mungbean (*Vigna radiata*) cultivars. *Indian Journal of Agricultural Sciences*. 84(4): 540-543.

Tamang, D., Nath, R and Sengupta, K. 2015. Effect of herbicide application on weed management in greengram (*Vigna radiata* (L.) Wilczek). *Advances in Crop Science and Technology*. 3(6): 568-593.

Panse, V.G and Sukhatme, P.V. 1985. *Statistical methods for agricultural workers*. Indian Council of Agricultural Research, New Delhi. 100-174.