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Research Communication

Bio-efficacy of early post-emergence herbicide combinations on weed flora, yield and economics of greengram (*Vigna radiata*)

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ABSTRACT

A field experiment was conducted during the rainy season, 2015 at Hyderabad, Telangana, on sandy-loam soil, to study the bio-efficacy of new-generation herbicidal combinations for weed management and their impact on weed flora, yield and economics of greengram [*Vigna radiata* (L.) Hepper]. A medium-duration variety 'MGG 295' was used for the study. The results revealed that combinations of haloxyfop-p-methyl @ 135 g/ha + imazethapyr @ 75 g/ha at 12–15 days after sowing (DAS) and quizalofop ethyl @ 50 g/ha + imazethapyr @ 75 g/ha at 12–15 DAS as early post-emergence were found promising for Southern Zone of Telangana for getting higher productivity and profitability.

Key words : Early post-emergence, Greengram, Hand-weeding, Net returns

Greengram is the third important pulse crop of India in terms of area (3.77 millon ha) and production (1.52 million tones) (DAC, 2015). It serves as a vital source of vegetable protein (19.1–28.3%) and vitamins (Singh *et al*., 2015). Weed infestation is one of the major constraints in greengram cultivation and causes 50–90% yield loss (Kumar *et al*., 2006). Hand-weeding is effective in controlling the weeds but unavailability of labor and continuous rainfall in the rainy season do not permit it to operate timely. It is also time-consuming and costly. Therefore, chemical control of weed forms an excellent alternative to manual as well as mechanical weeding and provides weed-free environment from emergence up to 30–35 days after sowing (Dungarwal *et al*., 2003). Hence present study was undertaken to find out the most effective early post-emergence herbicidal combinations on weed suppression, productivity and profitability in greengram.

The field experiment was conducted during the rainy season 2015 at College Farm, Rajendranagar, Hyderabad, Telangana, in a randomized block design with 3 replications. The experimental soil was sandy loam in texture, neutral in reaction, low in organic carbon and available nitrogen and high in available phosphorus and potassium. Eleven treatments, viz. pendimethalin @ 1.0 kg/ha as pre-emergence, pendimethalin followed by imazethapyr @ 75 g/ha as post-emergence (at 2–4-leaf stage), imazethapyr @ 75 g/ha, chlorimuron ethyl @ 9 g/ha, quizalofop ethyl @ 50 g/ha + imazethapyr @ 75 g/ha, imazethapyr + imazamox @ 70 g/ha, propaquizafop @ 50 g/ha + imazethapyr @ 75 g/ha, haloxyfop-p-methyl @ 135 g/ha + imazethapyr @ 75 g/ha, cycloxydim @ 80 g/ha + imazethapyr @ 75 g/ha, hand-weeding at 20 and 40 days after sowing (DAS) and unweeded control. The herbicidal combinations were applied at 12–15 DAS. The crop variety 'MGG 295' was sown on 25 July, 2015 at a spacing of 30 cm × 10 cm and fertilized with 20 : 40 : 30 kg N : P_2O_5 : K_2O/ha. All the herbicides were applied with knapsack sprayer fitted with flat-fan nozzle. In hand-weeding treatment, only manual weeding was done at 20 and 40 DAS. Data on weeds were recorded at harvesting by using quadrates (0.25 m^2) from 4 randomly selected places in individual plots. Weeds were counted and cut from the base for recording their total dry weight and then converted into square meter. Weed samples were sun-dried before oven drying at 70°C until constant weight was obtained. Data on weed dry weight were subjected to square-root transformation before statistical analysis to normalize their distribution. The experimental crop was finally harvested on 10th September, 2015 after taking 2 picking of pods. The

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Table 1. Effect of early post-emergence herbicides on weed flora, yield and economics of greengram

Treatment	Weed density (No/plant)	Weed dry matter (g/m^2)	Seed yield (kg/ha)	Cost of cultivation ($\times 10^3$ ₹/ha)	Net returns ($\times 10^3$ ₹/ha)	Benefit: cost ratio
Pendimethalin @ 1 kg/ha as pre-emergence	8.1 (64.4)	10.2 (102.2)	426	20.0	13.1	1.65
Pendimethalin @ 1 kg/ha followed by imazethapyr @ 75 g/ha as post-emergence (at 2-4 leaf stage)	6.3 (38.5)	7.8 (61.0)	912	21.7	48.4	3.23
Imazethapyr @ 75 g/ha	7.1 (49.0)	8.9 (77.8)	742	20.1	41.3	3.05
Chlorimuron ethyl @ 9 g/ha	8.1 (65.0)	10.2 (103.3)	224	20.1	-3.0	0.85
Quizalofop ethyl @ 50 g/ha + imazethapyr @ 75 g/ha	5.5 (29.5)	6.9 (46.5)	1008	21.8	55.7	3.55
Imazethapyr @ + imazamox @ 70 g/ha	6.3 (38.7)	7.7 (61.4)	900	22.42	46.8	3.09
Propaquizafop @ 50 g/ha + imazethapyr @ 75 g/ha	6.2 (38.2)	7.8 (60.5)	920	22.45	48.3	3.15
Haloxyfop-p-methyl @ 135 g/ha + imazethapyr @ 75 g/ha	5.5 (29.0)	6.8 (45.7)	1029	22.2	56.9	3.56
Cycloxydim @ 80 g/ha + imazethapyr @ 75 g/ha	7.1 (49.5)	8.9 (78.7)	737	20.9	38.4	2.84
Hand weeding at 20 and 40 DAS	2.3 (4.4)	2.0 (3.2)	1086	28.4	55.0	2.94
Unweeded control	9.9 (96.7)	12.5 (155.9)	425	18.4	14.6	1.79
SEm±	0.20	0.19	28	–	–	–
CD (P=0.05)	0.60	0.57	82	–	–	–

Original values are given in parentheses, which were transformed to "x+0.5; DAS, days after sowing

crop was sun-dried for 3 days and manual threshing was done separately for each experimental plot. The yield from all the pickings and finally harvested and threshed crop was combined to arrive at yield/ha. Economics of the treatments was computed by taking into account the prevailing market prices of inputs and crop outputs. The analysis of variance of data was carried out using OPSTAT and significance was tested by 'F-test'.

The results showed that application of early post-emergence herbicides significantly influenced the weed flora, yield and economics of greengram (Table 1). Significantly lower density and dry matter of weeds were recorded with hand-weeding at 20 and 40 days after sowing, followed by haloxyfop-p-methyl @ 135 g/ha + imazethapyr @ 75 g/ha applied at 12–15 DAS which remained at par with quizalofop ethyl @ 50 g/ha + imazethapyr @ 75 g/ha applied at 12–15 DAS. The seed yield was significantly superior with hand-weeding at 20 and 40 DAS and was on a par with haloxyfop-p-methyl @ 135 g/ha + imazethapyr @ 75 g/ha applied at 12–15 DAS and quizalofop ethyl @ 50 g/ha + imazethapyr @ 75 g/ha applied at 12–15 DAS. The combination of early post-emergence herbicides resulted in superior control of weeds leading to higher seed yield. These results corroborate the findings of Mirjha *et al*. (2013). Cost of cultivation was the highest in case of hand-weeding at 20 and 40 days after sowing, whereas it was the lowest for unweeded control. Significantly higher net returns were observed with haloxyfop-p-methyl @ 135 g/ha + imazethapyr @ 75 g/ha at 12–15 DAS which was on a par with quizalofop ethyl @ 50 g/ha + imazethapyr @ 75 g/ha at 12–15 DAS, whereas significantly lower net returns were observed with chlorimuron ethyl @ 9 g/ha at 12–15 days after sowing due to its phytotoxicity. Similar findings were reported by Begum and Rao (2006). Because of the higher cost of cultivation, hand-weeding at 20 and 40 DAS showed significantly lower net returns than haloxyfop-p-methyl @ 135 g/ha + imazethapyr @ 75 g/ha and quizalofop ethyl @ 50 g/ha + imazethapyr @ 75 g/ha due to more labour charges incurred for hand-weeding. Similar findings were reported by Jinger *et al*. (2016). Benefit: cost ratio was the highest with haloxyfop-p-methyl @ 135 g/ha + imazethapyr @ 75 g/ha at 12–15 DAS followed quizalofop ethyl @ 50 g/ha + imazethapyr @ 75 g/ha at 12–15 DAS, whereas lowest benefit: cost ratio was observed in chlorimuron ethyl @ 9 g/ha at 12–15 days after sowing due to its high phyto-toxicity throughout the crop growth.

From the above findings it is clear that the combinations of haloxyfop-p-methyl @ 135 g/ha + imazethapyr @ 75 g/ha at 12–15 DAS and quizalofop ethyl @ 50 g/ha + imazethapyr @ 75 g/ha applied at 12–15 DAS may be suggested for weed control in greengram in Southern Zone of Telangana for getting higher yield when there is scarcity of labour.

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