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Saketh Pallerla
 M.Sc (Ag.) Research Scholar,
 Department of Agronomy,
 Agricultural College, PJTSAU,
 Hyderabad, Telangana, India

G Satyanarayana Reddy
 Assistant Professor,
 Department of Agronomy,
 Agricultural College, PJTSAU,
 Hyderabad, Telangana, India

E Rajanikanth
 Scientist, Agronomy, NARP,
 Regional Agricultural
 Research Station, PJTSAU,
 Hyderabad, Telangana, India

Economically viable weed management practices in black gram

Saketh Pallerla, G Satyanarayana Reddy and E Rajanikanth

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Abstract

A field experiment was carried out, to find out economically viable weed management practice during *rabi*, 2023-24 at college farm, Agricultural college, Jagtial in which six different herbicidal combinations were investigated with three replications in a randomised block design the results revealed that the post emergence herbicide Fomesafen + Fluzifop-p-butyl 220 g ha⁻¹ (pre-mix) 11.1% + 11.1% SL PoE at 20 DAS was observed to be performed with maximum seed yield (725 kg ha⁻¹), Significantly higher gross returns (50,387 Rs ha⁻¹) and net returns (30,413 Rs ha⁻¹) among the chemical treatments in the respective investigation and stood as better herbicidal type solution, whereas unweeded check remained as lowest at seed yield and net returns.

Keywords: Black gram, herbicide, economics, weed

Introduction

In India, black gram is a significant pulse crop, which is cultivated in both the summer and the *kharif* season. In this crop cultivation, a large number of weeds have been identified and growing as a result of frequent irrigations in the summer and monsoon rains in the *kharif* season. Unchecked weeds have been shown to significantly reduce black gram grain yields; losses for summer black gram can range from 46.0 to 53.0% (Vaishya *et al.*, 2003; Bhandari *et al.*, 2004) ^[9, 1], while losses for *kharif* black gram can range from 43.2 to 64.1%. For summer black gram, the essential period for crop-weed competition is 10–40 days after sowing (Kumar and Tewari, 2004b) ^[2, 3], and in certain cases, it may even be 25–35 days after sowing (Randhawa *et al.*, 2002) ^[7]. Consequently, to get high yields of black gram, weeds must be removed at the proper time and with the appropriate technique. The conventional approaches to weed management, such as manual weeding or intercropping, are labour-intensive, costly, and ineffective. Furthermore, because of rising costs and a labour shortage, thorough weeding is not feasible at crucial periods of crop growth. Furthermore, the cultural methods of controlling weeds are hampered by persistent rains throughout the early phases of crop growth. It is impossible to eradicate weeds completely with a single herbicide application. In these situations, using pre- and post-emergence herbicides consecutively or in combination will successfully control the weeds. There are currently more different herbicides and their mixes with varied prices are available in the market that efficiently control a wide range of weeds. Keeping these things in consideration, the present research investigation was conducted to determine how weed can be controlled and the yield of irrigated black gram were affected by pre- and post-emergence herbicides as well as manual weeding techniques with prior economically benefited chemical combination is determined.

Materials and Methods

A field experiments were carried out at college farm, Agricultural College, Jagtial, India using the recently released black gram variety MBG-1070, during the *Rabi* season of 2023–2024 to determine the effects of pre- and post-emergence herbicides as well as hand weeding techniques on weed control and yield of irrigated black gram under irrigated conditions. The experiment was laid out in a randomized block design, comprising of eight treatments (T₁ to T₈) as pre-emergence application of Pendimethalin 30% EC 1000 g ha⁻¹ PE at 1 DAS (T₁), Imazethapyr + Imazamox 35% + 35% WG (pre-mix) 80 g ha⁻¹ PE at 1 DAS (T₂), Fomesafen

Corresponding Author:
Saketh Pallerla
 M.Sc (Ag.) Research Scholar,
 Department of Agronomy,
 Agricultural College, PJTSAU,
 Hyderabad, Telangana, India

+ Fluzifop-p-butyl 11.1% + 11.1% SL (pre-mix) 220 g ha⁻¹ PoE at 20 DAS (T₃), Aciflufen-sodium + Clodinafop-propargyl 16.5% + 8% EC (pre-mix) 245 g ha⁻¹ PoE at 20 DAS (T₄), Propaquizafop + Imazethapyr 2.5% + 3.75 ME (pre-mix) 125 g ha⁻¹ PoE at 20 DAS (T₅), Haloxypol R-methyl 108 g ha⁻¹ 10.5% EC PoE at 20 DAS (T₆), Hand weeding twice at 15 and 30 DAS (T₇), Unweeded check (T₈) were assessed using a randomized block design (RBD) with three replications. During the trial, the mean maximum and lowest temperatures were observed as 30.8 °C and 17.13 °C, respectively, 500 litres of water per hectare and a knapsack sprayer with a flat nozzle were used to apply the herbicides as pre-emergence (0–1DAS) and post-emergence (20 DAS). All additional recommended agronomic and plant protection practices were implemented to cultivate the crop, and intercultural operations were carried out as required. This includes all relevant information on crop production and yield characteristics. The experimental design data were statistically analysed using Fisher's analysis of variance approach, and treatment means were compared using an F-test and the least significant difference test at a 5% probability level to determine critical difference (CD) values. On all of the gathered data, analysis of variance was carried out. Economic related data were also analysed carefully with considerations of all the required needs.

Results and Discussion

Seed yield (kg ha⁻¹)

Highest seed yield was obtained with T₇ treatment (795 kg ha⁻¹) as the complete clearance of weeds at two intervals *ie* at 15 and 30 DAS paved to making better establishment of the crop and avoided crop weed competition at critical growth period, better translocation of nutrients and dry matter accumulation, similar results were found by Sahoo *et al.* (2017) [8]. Among the herbicidal treatments, T₃ resulted in highest seed yield (725 kg ha⁻¹), which is due to better control of weed growth by the chemical at 20 DAS, made the crop to flourish with maximum potential of growth and development, Similar results were reported in mung bean by (Yadav *et al.*, 2022) [11]. Since the chemical treatment counteract the weed growth effect and the crop growth in positive manner result in better seed yield in comparison with all the treatment chemicals. Lowest seed yield was noticed with T₈ treatment (350 kg ha⁻¹) which maybe due to high crop-weed competition for the nutrients and moisture throughout the crop period, Similar findings were reported by Mirjha *et al.* (2013) [5].

Haulm yield (kg ha⁻¹)

Significantly higher haulm yield was noticed with T₇ treatment (1485 kg ha⁻¹) followed by T₃ (1234 kg ha⁻¹), which also acts as maximum haulm yield among all the herbicidal treatments, might be due to the Stover yield of black gram was significantly higher under these weed control treatments may be attributed mainly to the better control of weeds during different stages, manual removal of emerging weeds by hand by herbicides and thereby providing better yield attributes. Lowest haulm was observed with T₈ treatment (720 kg ha⁻¹), which is due high crop weed competition and less dry matter accumulation. Similar findings were reported by (Vikas *et al.*, 2013) [10].

Harvest index (%)

Since harvest index is statistically observed as non-significant, all the treatmental influence on the crop in uniform manner.

Economics

A. Cost of cultivation: (Rs ha⁻¹)

Highest cost of cultivation is observed with T₅ treatment (22,174/-) as might be due to expensive chemicals usage and T₄ (21,253/-), T₆ (21,074/-), T₇ (21,032/-) were found statistically on par with it as all the herbicide chemical combinations are more or less similar, whereas least cost of cultivation was noticed with T₈ (18,874/-) unweeded check as it is devoid of any type of chemicals and manual labours too.

B. Gross returns: (Rs ha⁻¹)

Highest gross returns was observed with T₇ (55,252/-), as which it is result of maximum seed yield from the crop followed by T₃ (50,387/-), which is also best among rest of the herbicidal treatments. Lowest gross returns was observed with T₈ treatment (21,920/-) due to receive of lesser seed yield.

C. Net returns: (Rs ha⁻¹)

Maximum net returns was observed with T₇ (34,220/-) as it implies with the difference of maximum gross returns and minimal cost of cultivation, followed by T₃ (30,413/-), in which it acts as best herbicidal treatment with maximum net returns in comparison with all the herbicidal treatments and unweeded check. Similar results were observed in the green gram crop which was reported by (Nanda *et al.*, 2022) [6]. Lowest net returns was noticed with T₈ (3,046/-) unweeded check, because of lower seed yield.

D. Benefit -cost ratio (B:C ratio)

Highest B:C ratio was noticed with T₇ treatment (2.6) as obtained and among the herbicidal treatments T₃ treatment (2.5) was noticed and found that statistically at par with it, due to better gross returns over the cost of cultivation of the treatment, whereas lowest B:C ratio was observed with T₈ treatment unweeded check (1.2) due minimal seed yield obtain over biological yield of the crop. Similar kinds of results were reported by (Mansoori *et al.*, 2015) [4].

Conclusion

Based on the data pertaining to the experimental treatments, T₇ treatment Hand weeding twice at 15 and 30 DAS observed to be better at net returns and B:C ratio followed by T₃ treatment Fomesafen + Fluzifop-p-butyl 11.1% + 11.1% SL (pre-mix) 220 g ha⁻¹ PoE at 20 DAS was observed to be performed as maximum net returns (30,413/-) and highest harvest index (2.5) among all the herbicidal treatments, can be concluded as economically cost-effective chemical combination for the black gram cultivation.

Conflict of Interest

The author declares that there is no conflict of interest.

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