**Evaluation of Weed Management Effects Through Regression Analysis in Black Gram**

**ABSTRACT:**

A field experiment was carried out at agricultural college, jagtial in rabi season using eight treatments with randomised block experimental design in which two pre-emergence herbicidal treatments and four post emergence treatments along with hand-weeding twice and followed by unweeded check were evaluated to determine the effective weed management practice among the different herbicidal combinations. Among all the treatments hand weeding treatment at 15 and 30 days after sowing (DAS) have made the lowest weed dry weight. Among the herbicidal treatments Fomesafen + Fluzifop-p-butyl 11.1%+11.1% SL (pre-mix) 220 g ha-1 PoE at 20 DAS has resulted with lowest weed dry weight. After the experimental analysis it was observed that effect of different weed control treatments has profound influence on crop dry weight in while there is an inverse relation between weed dry weight and seed yield whereas increasing relation between seed yield and crop dry weight. As analysis of relationship among the crop dry weight, weed dry weight and seed yield was made using regression analysis.

***Keywords****:* Crop dry weight, Herbicide, Regression, Weed dry weight.

**Introduction**

Pulses crops are known for essential component of agricultural systems due to their nutritional, environmental, and economic benefits in which contribute significantly to sustainable farming by improving soil fertility, enhancing biodiversity, and supporting food security. In pulses group, Black gram also known as urad bean or *Vigna mungo* L., placed as a significant pulse crop widely cultivated in various regions, assumes with profound significant due to its high nutritional value, including protein and dietary fibre. As a leguminous crop, black gram plays an essential role in improving soil fertility by fixing atmospheric nitrogen. Loamy and clay loam soils are suitable for growing black gram, but soil that retains moisture is ideal for growth [6]. However, the crop suffers for initial competition for growth development against the weeds so, effective weed management is crucial for optimizing its yield and ensuring sustainable production, as the weeds compete for resources such as water, nutrients, and sunlight, often leading to reduced crop productivity [5,7]. The yield loss due to weed competition depends on the intensity and duration of competition as well as the stage of crop growth (Singh *et al*. 1991). Therefore, adopting integrated weed management practices—such as cultural methods (crop rotation and intercropping), mechanical control (tillage and mowing), and chemical approaches (herbicides) is vital, and these strategies not only help to mitigate weed competition but also enhance overall crop health and yield, contributing to food security and economic stability for farmers [8,9]. As integrated weed management is a cumbersome procedure, use of chemical herbicidal methods in labour shortage regions as mitigation technique for the control of weed growth. Emphasizing weed management in black gram cultivation ultimately leads to more efficient land use and sustainable agricultural practices [10,11]. Evaluation of the weed growth control for future scope of investigation in accordance with herbicidal treatments also important parameter relation in making better seed yield. Since regression analysis helps in understanding several factors in a graphical way the data was explained in its manner for this manuscript.

**Material 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-1PE at 1 DAS (T2) and as post-emergence application Fomesafen + Fluzifop-p-butyl 11.1%+11.1% SL (pre-mix) 220 g ha-1 PoE at 20 DAS (T3), Aciflurfen-sodium+Clodinafop-proparyl16.5%+8%EC (pre-mix) 245 g ha-1 PoE at 20DAS (T4), Propaquizafop + Imazethapyr 2.5%+3.75ME (pre-mix) 125 g ha-1 PoE at 20 DAS(T5), Haloxyfop R-methyl 108 g ha-1 10.5 % EC PoE at 20 DAS(T6), while 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 investigation, the mean maximum and lowest temperatures of the atmosphere were observed as 30.8°C and 17.13°C, respectively, 500 litres of water per hectare with a knapsack sprayer with a flat nozzle were used to apply the herbicides as pre-emergence(0–1DAS) and post-emergence (20 DAS). Recommended and required agronomic, intercultural operations and plant protection practices were carried out for cultivation the crop. which 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. Of all of the gathered data, regression analysis was carried out interpreted the results and their relationship. Weed dry weight was recorded at specified period were recorded by employing two quadrats (0.5 x 0.5 m) placed randomly in each plot. Experimental data were subjected to statistical analysis as per the procedures given by Panse and Sukhatme (1967) and inferences were drawn at 5% probability level. The data on weed density and dry weight were subjected to square root transformation (√x+0.5) before statistical analysis.

Figure 1: Graphical representation of regression analysis of crop dry matter and seed yield.

Figure 2: Graphical representation of regression analysis of weed dry matter and seed yield.

**Table 1: Effect of different treatments against seed yield, crop dry matter and weed dry matter**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S.no** | **Treatment details** | **Seed yield**  **(kg ha-1)** | **Crop dry matter**  **(g ha-1)** | **Weed dry matter**  **(g ha-1)** |
| 1. | Pendimethalin 30% EC 1000 g ha-1 PE at 1 DAS | 530 | 173 | 18.00  (324.90) |
| 2. | Imazethapyr + Imazamox 35%+35% WG (pre- mix) 80 g ha-1 PE at 1 DAS | 512 | 169 | 17.00  (288.40) |
| 3. | Fomesafen + Fluzifop-p-butyl 11.1%+11.1% SL (pre-mix) 220 g ha-1 PoE at 20 DAS | 725 | 213 | 10.40  (107.20) |
| 4. | Aciflurfen-sodium + Clodinafop-proparyl 16.5%+8% EC (pre-mix) 245 g ha-1 PoE at 20 DAS | 680 | 207 | 13.10  (171.90) |
| 5. | Propaquizafop + Imazethapyr 2.5%+3.75 ME (pre-mix) 125 g ha-1 PoE at 20 DAS | 584 | 175 | 18.40  (337.10) |
| 6. | Haloxyfop R-methyl 10.5 % EC 108 g ha-1 PoE at 20 DAS | 576 | 185 | 17.60  (307.70) |
| 7. | Hand weeding twice at 15 and 30 DAS | 795 | 245 | 11.30  (126.50) |
| 8. | Un-weeded (Check) | 350 | 115 | 20.50  (418.70) |
|  | **SEm±** | **17** | **5.5** | **0.3** |
|  | **CD(P=0.05)** | **50** | **16.7** | **0.8** |

Note: Values in parenthesis are the original; square root transformation (√x+0.5) used for statistical analysis

**Results and discussion:**

***Effect on weeds:***

The experimental field was infested and observed with diverse weed flora comprising grasses [(*Echinochloa colona* (L.), *Dactyloctenium aegyptium* (L.)], sedge [(*Cyperus rotundus* (L.) and broad-leaf weeds (BLW) [(*Trianthema portulacastrum* (L.), *Eclipta prostrate* (L).]. Singh *et al*. (1991) indicated that grassy species dominated the weed spectrum in black gram with more than 70% of the total weed density. Higher dry weight (418.70 g/m2) of grasses was recorded in weedy plot throughout crop growth. However, the dry weight (1.8 g/m2) of all types of weeds was significantly decreased when hand-weeding treatment was maintained.

***Effect on black gram:***

It is observed that higher seed yield (795 kg/ha) was recorded and significantly differed in hand-weeding at 15 and 30 DAS treatment followed by herbicidal treatmentFomesafen + Fluzifop-p-butyl 11.1%+11.1% SL (pre-mix) 220 g ha-1 PoE at 20 DAS (725 kg/ha)treatment was applied (Table 1). Crop dry matter accumulation was significantly decreased with increased duration of weed competition and lower crop dry matter accumulation (115 g/ha) were recorded under weedy plots. Earlier studies have also demonstrated that the poor growth and development of black gram crop under longer duration of weed competition (Kumar and Tewari 2004). The linear regression between seed yield and crop dry matter (R² = 0.8556) and significant and positive (fig 1) while seed yield and weed dry matter (R² = 0.8556) which is also significant but negative (fig 2).

**Conclusion*:***

The seed yield of the black gram noticed to be increased with increase in crop dry matter and decreased with increase in weed dry matter. The lower yields might be due to higher physical suppression and competition from the adjacent weed population during the crop period whereas better yields in hand weeding and herbicidal treatment Fomesafen + Fluzifop-p-butyl 11.1%+11.1% SL (pre-mix) 220 g ha-1 PoE at 20 DAS as they quote better control of weed growth over weedy check against the crop development.

**Disclaimer (Artificial intelligence)**

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

**References:**

1. Singh, G., Ram IC and Singh D. 1991. Crop- weed competition studies in green gram and black gram. *Pest Management* 37(2): 144–148.
2. Panse, V.G and Sukhatme, P.V. 1985. *Statistical Methods for Agricultural Workers*. Indian Council of Agricultural Research, New Delhi. 100-174.
3. Kumar A and Tewari AN. 2004. Crop- weed competition studies in summer sown black gram (*Vigna mungo* L.). *Indian Journal of Weed Science* **36**(1&2): 76–78.
4. Mansoori N, Bhadauria N, Rajput RL. Effect of weed control practices on weeds and yield of black gram (Vigna mungo). Legume Research-An International Journal. 2015;38(6):855-7.
5. Choudhary VK, Kumar PS, Bhagawati R. Integrated weed management in blackgram (Vigna mungo) under mid hills of Arunachal Pradesh. Indian Journal of Agronomy. 2012;57(4):382-5.
6. Pradhan, A., Singh, R. and Indu, T. (2022) “Effect of Spacing and Mulching on Growth and Yield of Black Gram in Prayagraj, Uttar Pradesh, India”, *International Journal of Plant & Soil Science*, 34(15), pp. 1–7. doi: 10.9734/ijpss/2022/v34i1531000.
7. Parthipan T, Ravi V, Subramanian E, Ramesh T. Integrated weed management on growth and yield of transplanted rice and its residual effect on succeeding black gram. Journal of Agronomy. 2013 Apr 1;12(2):99-103.
8. Aggarwal N, Singh G, Ram H, Khanna V. Effect of post-emergence application of imazethapyr on symbiotic activities, growth and yield of blackgram (Vigna mungo) cultivars and its efficacy against weeds. Indian Journal of Agronomy. 2014;59(3):421-6.
9. Selvakumar S, Ajaykumar R, Ammaiyappan A. Optimizing the application time of pre-emergence herbicide pendimethalin and oxyfluorfen application for effective weed management in irrigated blackgram (Vigna mungo L.) and its residue persistence. Legume Research. 2024;47(1):92-8.
10. Parihar AK, Hazra KK, Lamichaney A, Gupta DS, Singh AK, Dev J, Jaberson S, Lone AA, Das SP, Bindra S, Panwar RK. Eco-phenological drivers of black gram (Vigna mungo (L) Hepper) productivity in diverse environments and their implications for crop improvement. Field Crops Research. 2025 Mar 1;322:109756.
11. Kundu R, Bera PS, Brahmachari K. Effect of different weed management practices in summer mungbean (Vigna radiata L.) under new alluvial zone of West Bengal. Journal of Crop and Weed. 2009;5(2):117-21.