

Efficiency of herbicides on weed dynamics, growth and yield attributes of irrigated blackgram (*Vigna mungo* (L.) Hepper

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Abstract

Field experiment was conducted to study the efficiency of herbicides on weed dynamics, growth and yield parameters of irrigated blackgram. The experiment consisted of seven treatments laid out in randomized block design with three replications. The treatments involve pre-emergence herbicides viz., Pendimethalin and Flumioxazin, early post emergence herbicide viz., Imazethapyr, Quisqualopropargyl and other treatment hand weeding at 15 and 45 DAS were carried out. These treatments were experimented against a unweeded control treatment. The predominant weed flora present in the experimental field was *Cynodon dactylon*, *Brachiaria reptans* among grasses, *Cyperus rotundus* among sedges, *Cleome viscosa* and *Trichodesma indicum* among broad leaved weeds. Lowest values of weed parameters and highest values of growth and yield parameters were recorded with hand weeding twice on 15 and 30 DAS, which was followed by early post herbicide on sodium acifluorfen+ clodinafop propargyl @ 306.2 g ha⁻¹.

Key words : Blackgram, Herbicides, Weed density, LAI, Yield.

Blackgram (*Vigna mungo* (L.) Hepper is a nutritive pulse crop also known as *urdbean*, *mash*, mungbean, black mapte etc. is another third important short duration pulse grown in many parts of India. India is the largest producer and consumer of blackgram in the world. It is one of the most highly priced pulse crop in India. It is basically a tropical crop and mostly cultivated during summer as well as in *kharif* season⁸. Weeds are the principal biotic constraints that adversely influencing the productivity of blackgram. They compete for

different growth-limiting resources like nutrient, moisture and light during critical period of crop-weed competition. Therefore, weed control is essential to ensure the proper crop growth especially in early stage of the crop.

The critical period of crop-weed competition in blackgram is the first 20-40 days after sowing and season long weed competition has been found to reduce blackgram yield to the extent of 27-84 per cent depending on the kind and intensity of weed species¹. Weeds

can be checked by adopting various methods like cultural, manual, mechanical, biological and chemical. Though hand weeding effective against weeds, it has become expensive due to dependence on increased number of labour during period of sowing and harvesting. Increasing labour cost and constraints in availability on time, manual weed control is less economical practice for most of the agricultural crops. Hence, the use of pre emergence or early post emergence herbicides were to be studied for better weed control management in blackgram.

Field experiment was conducted at the Musiri (Taluk), Trichy district, Tamil Nadu is situated at 10° 44' N latitude and 78° 47' E longitude and at an altitude of 94.7 meters above the mean sea level. The soil of the experimental field is sandy clay loam in texture which is low in N, medium in available P and high in available K. The research was laid out in randomized block design with seven treatments and three replications by using the blackgram variety VBN-5. The treatments comprised of unweeded control (T_1), Hand weeding twice on 15 and 30 DAS (T_2), pre-emergence application of Pendimethalin @ 750 g ha⁻¹ on 3 DAS (T_3), Early post emergence application of imazethapyr @ 90 g ha⁻¹ on 12-15 DAS (T_4), Early post emergence application of quizalofop-p-ethyl @ 50 g ha⁻¹ on 12-15 DAS (T_5), Early post emergence application of sodium acifluorfen + clodinafop propargyl @ 306.2 g ha⁻¹ on 12-15 DAS (T_6), Pre-emergence application of Flumioxazin @ 125 g ha⁻¹ on 3 DAS (T_7). These treatments with compared against unweeded control treatment.

All the weed management treatments

significantly influenced the weed parameters like weed count and LAI, number of pods plant⁻¹, number of seeds pod⁻¹, Grain yield and haulm yield in irrigated blackgram. The predominant weed species in the experimental field comprised of grasses, sedges and broad leaf weeds were observed in the experimental field. The weed species are *Cynodon dactylon* and *Brachiaria reptans* among grass, *Cyperus rotundus* among sedge and *Trichodesma indicum* and *Cleome viscosa* among broad leaved weeds.

Effect on weed count :

Among the treatments compared in our present study, the treatment with hand weeding twice recorded lesser weed parameter and this could be attributed to the removal of existing weed by hand weeding twice on 15 and 30 DAS (Table-1) and performed better by keeping the weed infestation under control throughout the cropping period. This might be due effective removal of weeds from both inner and intra rows by hand weeding twice at 15 and 30 DAS. This was followed by the treatment with sodium acifluorfen + clodinafop propargyl @ 306.2 g ha⁻¹ (T_6) as early post emergence on 15 DAS. This might be due to the broad spectrum activity of the herbicide, the retarded cell division of meristems as a result of which weeds died rapidly⁶. Further, early post emergence application in the herbicide registered greater efficiency due to destruction of weeds in the early stages of weed growth might contributes for better performance of the herbicide. The highest count of grass, sedge and broad leaved weeds were recorded with unweeded control and this might be due to germinated and vigorous growth of weeds

Table-1. Effect of weed management on weed count, plant height and LAI of blackgram

Treatments	Total weed count (30 DAS)	Total weed count (45 DAS)	Plant height (cm) (45 DAS)	LAI (At flowering stage)
T ₁ – Unweeded Control	8.54 (72.49)	10.23 (104.22)	22.08	2.22
T ₂ – Hand weeding twice on 15 and 30 DAS	4.08 (16.22)	5.50 (29.81)	36.82	4.55
T ₃ – Pendimethalin @ 750 g ha ⁻¹	7.37 (53.93)	8.73 (75.79)	26.45	3.49
T ₄ – Imazethapyr @ 90 g ha ⁻¹	6.39 (40.38)	7.72 (59.60)	30.42	3.85
T ₅ – Quizalofop-p-ethyl @ 50 g ha ⁻¹	6.83 (40.38)	7.84 (61.10)	29.45	3.83
T ₆ – Sodium acifluorfen + Clodinafop propargyl @ 306.2 g ha ⁻¹	4.91 (23.66)	6.90 (47.18)	33.28	4.19
T ₇ – Flumioxazin @ 125 g ha ⁻¹	7.46 (55.25)	8.79 (76.89)	26.04	3.42
SEm±	0.16	0.19	0.84	0.10
CD (P= 0.05)	0.51	0.60	2.63	0.33

(Figures in parenthesis indicate original values).

along with the crop in the unweeded plot, that competed for resources management for the irrigated blackgram crop, throughout the crop season³.

Effect on growth attributes :

The results showed that all the treatments exerted significant influence on crop growth attributes like plant height, leaf area index (LAI) (Table-1). Among the weed control treatments, hand weeding twice at 15 and 30 DAS (T₂) significantly influenced the crop growth components like plant height and LAI. Weed free environment during the critical

period of the crop growth by hand weeding facilitated good growth of the crop. Further, improved nutrient uptake and vigour due to elimination of weed competition right from the beginning of the crop might have contributed to favourable growth components, higher nutrient uptake and consequently higher plant height, LAI in hand weeding twice treatment (T₂). The superiority of hand weeding practice at 15 and 30 DAS might be attributed to better weed control, least nutrient accumulation by weeds and better aeration of the crop¹⁰. It was followed by early post emergence application of sodium acifluorfen + clodinafop propargyl

Table-2. Effect on weed management on yield attributes, grain and haulm yield of irrigated blackgram

Treatments	Number of pods plant ⁻¹	Number of seeds pod ⁻¹	Grain yield (kg ha ⁻¹)	Haulm yield (kg ha ⁻¹)
T ₁ – Unweeded Control	7.54	5.2	426	803
T ₂ – Hand weeding twice on 15 and 30 DAS	16.64	6.9	910	1528
T ₃ – Pendimethalin @ 750 g ha ⁻¹	10.53	5.8	778	1164
T ₄ – Imazethapyr @ 90 g ha ⁻¹	12.27	6.3	826	1359
T ₅ – Quizalofop-p-ethyl @ 50 g ha ⁻¹	12.16	6.2	819	1344
T ₆ – Sodium acifluorfen + Clodinafop propargyl @ 306.2 g ha ⁻¹	14.38	6.6	868	1463
T ₇ – Flumioxazin @ 125 g ha ⁻¹	10.42	5.7	771	1156
SEm±	0.41	0.09	12.37	38.91
CD (P= 0.05)	1.29	0.29	37.12	121.23

@ 306.2 g ha⁻¹ (T₆). This might be due to better control of all categories of weeds, which reduced the crop weed competition *viz.*, nutrients, moisture, sunlight with space, to the blackgram crop, thus resulted in higher growth parameters^{3,5}. Unweeded control recorded the least growth parameters such as plant height and LAI, because of the poor control of weeds that leads to more weed population and heavy competition between crop and weeds^{4,11}.

Effect on yield attributes :

All the treatments had a pronounced effect on the yield attributes of irrigated blackgram. Among the treatments, hand weeding twice on 15 and 30 DAS (T₂) (Table-2) provided a perfect weed free environment throughout the critical period of crop growth and offered

significantly highest value of yield components in the crop. This might be due to reduced crop weed competition in the critical stages which helped in synchronization of their production by increasing^{2,7,10} the number of pods plant⁻¹ and number of seeds pod⁻¹. The treatment with sodium acifluorfen + clodinafop propargyl @ 306.2 g ha⁻¹ (T₆) was found to be next in order. This might be due to the reason that lower weed population had provided favourable environment to the crop and least crop weed competition, which resulted in higher photosynthetic accumulation rate and better translocation to the sink as compared to unweeded control^{9,12}. The lowest yield attributes were recorded under unweeded control. Severe weed competition exerted by weeds for the available resources throughout the crop growth might have reduced the yield

components of irrigated blackgram.

Effect on grain yield and haulm yield :

Grain and haulm yield was higher in hand weeding twice on 15 and 30 DAS (T_2) with 910 and 1528 kg ha⁻¹. It was followed by the application of sodium acifluorfen + clodinafop propargyl @ 306.2 g ha⁻¹ (T_6) with 868 and 1463 kg ha⁻¹. The unweeded control (T_1) was recorded lower grain yield and haulm yield of 426 and 803 kg ha⁻¹. This might be due to the lower crop weed competition, weed population and weed dry weight, enabling the crop to establish and to grow vigorously resulting in better growth and development of the crop¹³.

From the present study, it could be concluded that hand weeding twice on 15 and 30 DAS (T_2) significantly recorded the least weed population and favouring higher growth attributes, yield attributes, grain yield and haulm yield in irrigated blackgram compared to other treatment and among the herbicides sodium acifluorfen + clodinafop propargyl @ 306.2 g ha⁻¹ found to be the best herbicide option in situations with shortage of labour and with higher labour cost.

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