

Evaluation of post emergence herbicide and its time of application on blackgram under rice fallow condition

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Abstract : Field experiment was conducted at Agricultural College and Research Institute, (Tamil Nadu Agricultural University) Killikulam during January to April 2008 to study the effect of post emergence herbicide imazethapyr on weed characters, growth and yield of black gram variety (ADT 3) under rice fallow situation. The experiment was laid out under split plot design with three replications. The treatments consisted of three times (14, 21 and 28 days after sowing) of application in main plot and post emergence herbicide imazethapyr at 60, 75 and 90 g ai ha⁻¹ and an absolute control formed the subplot treatments. The results revealed that the effect of imazethapyr on weed density, weed dry weight and weed control efficiency was on par when applied on either 21 or 28 DAS. Application of imazethapyr at the rate of 90 g ai ha⁻¹ recorded lowest weed density and weed dry weight and on par with that of 75 g ai ha⁻¹. Higher growth and yield attributes of black gram were associated with imazethapyr application on 21 DAS at 90 g ai ha⁻¹. The highest grain yield of 759 kg ha⁻¹ was recorded under 21 DAS than other times of application of herbicide. Among the doses, application of imazethapyr at 90 g ai ha⁻¹ registered significantly the highest grain yield (751 kg ha⁻¹) than other doses and control. The favourable economic benefits in terms of higher gross income, net income and benefit – cost ratio were also observed by the application of imazethapyr at 90 g ai ha⁻¹ on 21 DAS.

Key words: *Black gram, Imazethapyr, Weed control, Grain yield, Economics.*

Introduction

Black gram is one of the important pulse crops in Tamil Nadu and grown under irrigated, rainfed and rice fallow conditions. Weeds compete for water, nutrients and space and cause upto 45 per cent yield loss in blackgram (Yadav *et al.*, 1997). The control of weeds during critical period of crop weed competition is very important so as to avoid yield loss. Weed control under rice fallow black gram will further enhance the productivity as it is neglected under rice fallow black gram. Selective herbicide can be one of the best alternatives for economic and timely weed

control in black gram as it depends on availability of labour in time and field accessibility. Recently some post emergence herbicides are being marketed with the assurance of selective control of weeds in blackgram. Since the information on the effect of these herbicides is meagre, this trial was undertaken to study the effect of imazethapyr on the weeds and yield of black gram under rice fallow conditions.

Materials and Methods

Field experiment was conducted at Agricultural College and Research Institute, Killikulam

Table 1. Effect of post emergence herbicide application on weed characters and growth of rice fallow black gram

Treatment	Weed density on 35 DAS (No m ⁻²)	Weed dry weight on 35 DAS (kg ha ⁻¹)	Weed control efficiency	Plant height 45 DAS	LAI on 45 DAS	DMP at harvest (kg ha ⁻¹)
Time of Application						
T ₁ - 14 days after sowing	227.3	190.1	42.5	41.2	3.09	2052
T ₂ - 21 days after sowing	195.6	168.2	50.6	45.6	3.81	2478
T ₃ - 28 days after sowing	193.8	151.9	50.8	43.5	3.52	2145
CD (P=0.05)	25.1	18.7	4.9	NS	0.40	224
Dose of Application						
W ₂ - Imazethapyr @ 60 g ai ha ⁻¹	87.0	83.6	77.7	42.0	3.11	2113
W ₂ - Imazethapyr @ 75 g ai ha ⁻¹	74.2	79.1	81.0	46.4	3.47	2238
W ₃ - Imazethapyr @ 90 g ai ha ⁻¹	60.8	70.0	84.6	47.9	3.79	2546
W ₄ - Absolute control	394.8	280.2	-	-	-	-
CD (P=0.05)	18.0	14.3	8.3	4.2	0.31	166
Interaction	NS	NS	NS	NS	NS	NS

during January to April 2008 to study the effect of post emergence herbicide imazethapyr on weed characters growth and yield of black gram. The experiment was laid out under split plot design with three replications. The treatments consisted of three times (14, 21 and 28 days after sowing) of application in main plot and post emergence herbicide imazethapyr at 60, 75 and 90 g ai ha⁻¹ and an absolute control formed the subplot treatments. The soil of the experimental field was clay loam with a pH of 6.2 and having NPK status of medium, medium and low, respectively. The black gram variety ADT 3 was sown under rice fallow situation four days before the harvest of paddy. The post emergence herbicide imazethapyr (Pursuit 10% SL) was applied using flat-fan nozzle as per treatment schedule. Observation on weed characters, growth and yield attributes and grain yield were recorded. The economic analysis was done on the basis of prevailing market prices of inputs used and output obtained in each treatment.

Results

Effect on weeds

The major weed flora observed in the experimental field were *Echinochloa crusgalli*, *Echinochoa colona* *Cyperus rotundus*, *Cynodan dactylon*, *Cleome viscosa* etc. The weed population and weed dry weight recorded by the application of herbicide at 21 days after sowing (DAS) and 28 DAS were significantly lower than that of 14 DAS (Table 1). Among the doses, imazethapyr at 90 g ai ha⁻¹ recorded the lowest

Table 2. Effect of post emergence herbicide application on yield and economics of rice fallow black gram

Treatment	Number of pods/plant	Number of grains / pod	Grain yield (kg ha ⁻¹)	Cost of cultivation	Gross income (Rs ha ⁻¹)	Net Income (Rs ha ⁻¹)	Benefit Cost ratio
Time of Application							
T ₁ -14 days after sowing	17.1	5.8	622	7140	15558	8418	2.18
T ₂ -21 days after sowing	21.8	7.0	759	7140	18985	11845	2.66
T ₃ - 28 days after sowing	18.2	6.2	651	7140	16280	9140	2.28
CD (P=0.05)	2.3	0.7	101	-	-	-	-
Dose of Application							
W ₂ - Imazethapyr @ 60 g ai ha ⁻¹	17.3	5.2	625	6870	15635	8765	2.28
W ₂ - Imazethapyr @ 75 g ai ha ⁻¹	19.1	5.7	675	7140	16863	9723	2.36
W ₃ - Imazethapyr @ 90 g ai ha ⁻¹	22.8	6.8	751	7410	18775	11365	2.53
W ₄ - Absolute control	11.4	4.8	429	5540	10718	5178	1.93
CD (P=0.05)	1.6	0.5	74	-	-	-	-
Interaction	NS	NS	NS	-	-	-	-

weed density (60.8 m⁻²) and dry weight (70.0 kg ha⁻¹) which was on par with the application of Imazethapyr 75 g ai ha⁻¹ and both were on par and significantly lower than that of 60 g ai ha⁻¹. The weed control efficiencies were higher when herbicide applied at later stages (21 or 28 DAS) than at earlier stages (14 DAS). Higher dose of Imazethapyr application (90 and 75 g ai ha⁻¹) recorded significantly higher weed control efficiencies than lower dose. Imazethapyr at 75 g ai ha⁻¹ controlled only broad leaved weeds in soybean observed by Tiwari *et al.* (2007). Application of Imazethapyr at 0.10 kg ai ha⁻¹ controlled the weeds most effectively than other herbicides in summer irrigated black gram (Mishra and Chandra Banu, 2006).

Effect of crop growth

The effect of time of application of post emergence herbicide on plant height though did not differ significantly, application at 21 and 28 DAS registered significantly higher LAI and dry matter production (DMP) than 14 DAS. Among the doses, the effect of imazethapyr at 90 and 75 g ai ha⁻¹ on plant height was almost same, however imazethapyr at 90 g ai ha⁻¹ recorded significantly higher LAI (3.79) and DMP (2546 kg ha⁻¹) than that of 75 g ai ha⁻¹. Post emergence application of Imazethapyr at lower dose 60 g ai ha⁻¹ recorded significantly the shortest plants, lowest LAI and DMP. Lower weed density under higher dose of application minimize the weed composition with crop and thus favoured the crop growth which lead to higher growth attributes of black gram.

Effect on yield attributes

The yield attributing characters of black gram *viz.*, number of pods plant⁻¹ and

number of grains pod⁻¹ were higher under Imazethapyr applied on 21 DAS, which was significantly superior than other times of application. Among the doses, Imazethapyr application at 90 g ai ha⁻¹ resulted in significantly higher number of pods plant⁻¹ (22.8) and number of seeds pod⁻¹ (6.8) than that of lower doses of application. Lower weed controlling efficiencies and higher weed growth under low doses of Imazethapyr application might have lead to poor growth of plants which intern caused lesser yield attributing characters.

Yield

Highest grain yield of 759 kg ha⁻¹ was observed when herbicide applied on 21 DAS which significantly superior than other times of application (Table 2). With respect to doses, application of Imazethapyr at 90 g ai ha⁻¹ registered significantly higher yield of 751 kg ha⁻¹ followed by 75 g ai ha⁻¹ (675.5 kg ha⁻¹). The lowest grain yield of 625 kg ha⁻¹ was recorded by Imazethapyr at 60 g ai ha⁻¹ and this was significantly lower than other doses. The yield increments due to the application of imazethapyr to 90, 75 and 60 g ai ha⁻¹ were 45.8, 57.4 and 75.3 per cent than control (unweeded check). Superior yield attributing characters and effective weed control contributed to higher yields higher doses of post emergence herbicide. In soybean, post emergence herbicide haloxyfop ethoxy-ethyl at 50 and 75 g ai ha⁻¹ recorded higher yields (Tiwari *et al.*, 2007). In rice fallow black gram highest grain yield was obtained with imazethapyr than other pre and post emergence herbicide (Gowsia Begum and Rao, 2006).

Economics

Post emergence application of imazethapyr on 21 DAS was found more remunerative

as it fetched maximum gross income of Rs. 18985 ha⁻¹, net income of Rs. 11845 ha⁻¹ and benefit cost ratio of 2.66 followed by spraying on 28 DAS. Regarding the doses, higher economic returns were obtained by the application of imazethapyr at 90 g ai ha⁻¹ followed by that of 75 g ai ha⁻¹. Imazethapyr at 90 g ai ha⁻¹ recorded higher gross income (Rs. 18775 ha⁻¹), net income (Rs. 11365 ha⁻¹) and benefit cost ratio (2.53) which surpassed the benefits than lower doses. Excellent control of weeds without any adverse effect on growth and yield might be attributed to superior economic indices under higher doses of application on 21 DAS. Under irrigated black gram highest monetary returns and benefit cost ratio were obtained with oxyfluorfen at 0.1 kg ai ha⁻¹ and fluchlordin 0.9 kg ai ha⁻¹ (Shaik *et al.*, 2002).

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