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## Efficacy of pre and post emergence herbicides on weed flora in blackgram

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**Abstract**

A field experiment was conducted at Birsra Agricultural University, Ranchi, Jharkhand during rainy and winter seasons of 2014-2015 and 2015-2016 in sandy-loam soil to study the Efficacy of pre and post emergence herbicides on weed flora in blackgram. The experiment were carried out with sixteen weed control treatment i.e. Imazthapyr 50g/haPRE (T1), Imazthapyr 70g/haPRE (T2), Imazthapyr 80g/haPRE (T3), Imazthapyr 50g/ha POE (T4), Imazthapyr 70g/haPOE (T5), Imazethapyr 80g/haPOE (T6), Imazethapyr. + Imazemox 50g/ha PRE (T7), Imazethapyr. + Imazemox 70g/haPRE (T8), Imazethapyr. +Imazemox 80g/ha PRE (T9), Imazethapyr. + Imazemox 50g/ha POE (T10), Imazethapyr. +Imazemox 70g/ha POE (T11), Imazethapyr. + Imazemox 80g/ha POE (T12), Pendimethalin1000g/ha PRE (T13), Imazethapyr + Pendimethalin 1000g/ha (T14), Hoeing twice (T15) each performed at 20 and 40 DAS and weedy check (T16). The experiment were laid out in RBD and result revealed that the field were infested with all three types of weeds which mainly consist of *Ageratum conyzoids*, *Commelina nudifolia*, *Ellusine indica*, and *Cyperus iria*. Among all treatments application of Imazethapyr+ Imazemox 80g/ha as post emergence was most effective weed control methods most efficient in reducing weed density and dry weight as well as better crop growth, higher yield of blackgram.

**Keywords:** Blackgram, weed management, pre-emergence, post-emergence, imazethapyr

**Introduction**

Black gram (*Vigna mungo* L. Hepper) also known as urdbean, mash, mungobean, black maple etc. is another important short duration pulse crop grown in many parts of India. It is a self-pollinated annual crop belonging to leguminosae family and supplies a major share of protein requirement of vegetarian population of the country. It suits well in the cropping system being a short duration crop and vacate the field well in time giving the opportunity to many winter crops like mustard, lentil etc. Heavy weed infestation is the dominant reason for a low yield of blackgram (Rao *et al.*, 2010) [10]. Most sensitive period of weed competition is in between 3 to 6 weeks after sowing. Singh *et al.* (1991) [3] reported that the major weed species in black gram during the monsoon seasons were *Echinochloa colonum*, *Dactyloctenium aegyptium*, *Eleusine indica*, *Digitaria sanguinalis*, *Celosia argentea*, *Phyllanthus niruri*, *Cleome viscosa*, *Cyperus rotundus* and *C. iria* infested black gram field. Gogoi *et al.* (1992) [1] reported that weeds reduce yield of black gram to the extent of 78% and sometimes lead to the total failure of crop. Thus, it is necessary to eliminate weeds from crop at proper time and with suitable methods. Manual removal of weed is labour intensive and tedious, therefore chemical method is used for weed removal. Imazethapyr controls monocot and dicot weeds when applied pre-plant incorporated, pre-emergence, and post-emergence and has a strong residual life (Taylor *et al.*, 1988). It is mainly used to control many major annual and pernnial grasses and broad-leaved weeds (Sondhia & Varshney 2010) [4].

**Materials and Methods**

A field experiment was conducted at Birsra Agricultural University, Ranchi, Jharkhand during rainy and winter seasons of 2014-2015 and 2015-2016. The experimental soil was sandy-loam Intexture with low organic carbon (3.4 g/kg), moderately acidic (pH 5.6) in nature, low available nitrogen (189.00 kg/ha), medium phosphorus (21 kg/ha) and medium potassium (155 kg/ha) content. The experiment was laid out in a RBD with 16 treatments i.e. Imazthapyr 50g/haPRE (T1), Imazthapyr 70g/haPRE (T2), Imazthapyr 80g/haPRE (T3), Imazthapyr 50g/ha POE (T4), Imazthapyr 70g/haPOE (T5), Imazethapyr 80g/haPOE (T6), Imazethapyr. + Imazemox 50g/haPRE (T7), Imazethapyr. + Imazemox 70g/haPRE (T8), Imazethapyr. + Imazemox 80g/ha PRE (T9), Imazethapyr. + Imazemox 50g/ha POE (T10), Imazethapyr. + Imazemox 70g/ha POE (T11), Imazethapyr. + Imazemox 80g/ha POE (T12), Pendimethalin

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1000g/ha PRE (T13), Imazethapyr + Pendimethalin 1000g/ha (T14), Hoeing twice (T15) each performed at 20 and 40 DAS and weedy check (T16) replicated thrice. Blackgram *var.* T9 and mustard *var.* Shivani was sown at 30 cm using 30 and 5 kg seed/ha, with RDF 20:40:20 and 80:40:20 kg/ha, respectively. Protective irrigation were applied whenever it was necessary during crop growth. Weed density(no./m<sup>2</sup>) was recorded by putting a quadrat of 0.25 m<sup>2</sup> at two random spots in each plot and after drying them in hot air oven (650 C for 48 hours) weed dry weight (g/m<sup>2</sup>) was recorded. Weed density was subjected to  $\sqrt{x + 0.5}$  transformation. Weed control efficiency was estimated on the basis of reduction in weed weight in comparison with unweeded control and expressed as an index taking weed free as 100% efficiency.

### Weed flora

Total no. of species was 9 in experimental field of blackgram out of which *Ageratum conyzoids*, *Commelina nudifolia*, *Commelina benghalensis*, *Estelleria media* among broad leaved weeds *Ellusine indica*, *Echinochloa crusgalli*, *Cynodon dactylon* among grasses and *Cyperus iria* among sedges were dominant. Among all weed categories broad leaved weeds, grassy and sedges accounted for 57.07%, 27.39% and 15.54% respectively. Among species *Ageratum conyzoids* (44.21%), *Ellusine indica* (14.95%), *Cynodon dactylon* (13.08%), *Echinochloa crusgalli* (10.28%), *Commelina nudifolia* (7.47%).

### Weed Density

Weed density were found minimum under Imazethapyr. + Imazemox 80g/ha POE (T12). Weed densities of broad leaf, narrow leaf and sedges at 30 and 60 DAS under T12 treatment were recorded 5.71, 3.02, 0.71 and 7.39, 4.97, 1.00g/m<sup>2</sup>. Total weed population were also recorded minimum under Imazethapyr. + Imazemox 80g/ha POE (T12) which is similar with Imazethapyr. + Imazemox 70g/ha POE (T11). All the single and double herbicide combinations suppressed the broad leaf, narrow leaf and sedges weeds significantly as compared to weedy check which recorded highest weed infestation (13.79, 8.92, 4.65 and 19.35, 13.41, 10.13g/m<sup>2</sup> at 30 and 60 DAS of observation respectively).

### Weed dry matter

All weed control treatments significantly reduced weed dry weight. In 2014 and 2015 at 30DAS minimum weed dry weight of broad leaf, narrow leaf and sedges were recorded in

Imazethapyr. + Imazemox 80g/ha POE (T12) i.e. 0.85, 1.09 and 0.71 g/m<sup>2</sup> which was similar with T11.

Similar result were found in 60 DAS at 2014 and 2015. Minimum dry weight of weeds was recorded in Imazethapyr. + Imazemox 80g/ha POE (T12) i.e. 1.19 and 2.09 g/m<sup>2</sup> which was significantly lower than all other weed control treatments at 30 DAS and were similar with T11 at 60 DAS.

During 2014, weed control efficiency at 30 and 60 DAS was highest in Imazethapyr. + Imazemox 80g/ha POE (T12) followed by Imazethapyr. + Imazemox 70g/ha POE (T11) similar observation was recorded in 2015. Weed control efficiency was lowest in Imazethapyr. + Imazemox 50g/haPRE (T7) and Imazethapyr 50g/ha POE (T4) due to poor weed control at lower dose during both the years.

The weed management practices improved growth i.e. plant height and branches/plant, yield attributes i.e. pods/plant and seed/pod of blackgram over unweeded control. This shows that application of imazethapyr at different doses and different time of application had no adverse effect on growth of blackgram. Under pooled data, application of Imazethapyr.+ Imazemox 80g/ha POE (T12) recorded highest pod/plant which were similar with Imazethapyr.+ Imazemox 70g/haPRE (T8), Imazethapyr.+ Imazemox 80g/ha PRE (T9), Imazethapyr.+ Imazemox 70g/ha POE (T11) and Pendimethalin1000 g/ha PRE (T13). Seeds/pod were recorded non significant to rest of the weed treatments except weedy check under pooled data similarly 1000 seed weight were recorded highest in Imazethapyr.+ Imazemox 80g/ha POE (T12) which was at par with Imazethapyr 80g/haPRE (T3), Imazethapyr.+ Imazemox 70g/ha POE(T11) and Pendimethalin1000 g/ha PRE (T13).

Application of imazethapyr + imazamox @ 80g/ha post emergence (T12) recorded 108.78, 46.11 and 70.91 percent higher seed yield compared to weedy check during 2014, 2015 and under pooled data, but it was on par with imazethapyr @ 80g/ha pre emergence (T3), imazethapyr + imazamox @ 80g/ha pre emergence (T9), imazethapyr + imazamox @ 70g/ha post emergence (T11) and pendimethalin 1000g/ha pre emergence (T13) during 2014, 2015 and under pooled data also similar with imazethapyr @ 80g/ha post emergence (T6), imazethapyr + imazamox @ 70g/ha pre emergence (T8) during 2014 and 2015 also similar with imazethapyr @ 50g/ha pre emergence (T1), imazethapyr @ 70g/ha pre emergence (T2), imazethapyr @ 70g/ha post emergence (T5), imazethapyr + imazamox @70g/ha post emergence (T10), imazethapyr + pendimethalin 1000g/ha pre emergence (T14) and hoeing twice (T15) during 2015.

**Table 1:** Weed density of blackgram as influenced by weed management practices (Pooled for two years)

Treatments	Weed density/m <sup>2</sup> at 30DAS			Weed density/m <sup>2</sup> at 60DAS		
	Broad Leaf	Grasses	Sedges	Broad Leaf	Grasses	Sedges
T1 (Imaze. 50g/haPRE)	17.05(291)	13.23(175)	6.13(37)	17.70(315)	11.38(130)	6.14(37)
T2 (Imaze. 70g/haPRE)	14.17(200)	10.96(120)	5.55(31)	16.62(276)	10.81(117)	5.20(27)
T3 (Imaze. 80g/haPRE)	8.54 (76)	4.42 (19)	2.11(4)	10.45(112)	5.45(30)	2.26(5)
T4 (Imaze. 50g/haPOE)	17.36(302)	13.74(188)	6.43(41)	18.03(329)	11.62(135)	6.29(39)
T5 (Imaze. 70g/haPOE)	15.77(248)	12.01(144)	5.72(32)	16.92(287)	10.97(120)	5.67(32)
T6 (Imaze. 80g/haPOE)	11.89(143)	7.70(59)	4.02(16)	14.13(200)	9.11(84)	4.05(16)
T7 (Imaze. + Imazemox 50g/haPRE)	18.59(345)	15.31(236)	7.38(54)	18.95(359)	12.65(160)	6.59(43)
T8 (Imaze. + Imazemox 70g/haPRE)	11.42(131)	7.11(51)	3.78(14)	13.74(189)	8.31(69)	3.95(15)
T9 (Imaze. + Imazemox 80g/haPRE)	11.23(127)	6.15(37)	3.29(11)	12.74(164)	8.12(66)	3.01(9)
T10 (Imaze. + Imazemox 50g/haPOE)	12.44(156)	8.59(74)	4.55(21)	14.17(203)	9.38(88)	4.11(17)
T11 (Imaze. + Imazemox 70g/haPOE)	7.32(53)	4.14(18)	1.61(3)	9.78(99)	5.32(28)	1.94(3)
T12 (Imaze. + Imazemox 80g/haPOE)	5.71(33)	3.02(9)	0.71(0)	7.39(55)	4.97(26)	1.00(1)
T13 (Pendim. 1000g/haPRE)	9.12(84)	4.92(24)	2.80(7)	12.20(150)	5.73(34)	2.74(7)
T14 (Imaze. + Pendi.1000g/ha)	14.02(197)	10.44(109)	4.80(23)	15.44(240)	10.64(113)	4.72(22)

T15 (Hoeing twice)	13.79(190)	8.92(79)	4.65(21)	15.20(237)	10.29(106)	4.29(18)
T16 (weedy check)	18.95(359)	17.37(301)	11.95(143)	19.35(375)	13.41(180)	10.13(102)
S. Em±	0.71	0.47	0.35	0.99	0.55	0.29
CD=(0.05)	2.12	1.40	1.03	2.96	1.65	0.87
CV%	9.50	8.76	12.72	11.81	10.33	11.27

\*Data in parenthesis were transformed to  $\sqrt{x+0.5}$  before analysis

**Table 2:** Weed dry matter of blackgram as influenced by weed management practices (Pooled for two years)

Treatments	weed dry matter 30DAS			weed dry matter 60DAS			weed Control efficiency %	
	Broad Leaf	Grasses	Sedges	Broad Leaf	Grasses	Sedges	30DAS	60DAS
T1(Imaze. 50g/haPRE)	3.35(11)	4.69(22)	1.79(2.75)	3.35(11)	7.01(49)	2.32(5)	60.24	55.09
T2(Imaze. 70g/haPRE)	3.17(10)	4.21(18)	1.62(2.13)	2.93(8)	5.66(32)	0.71(0)	66.37	72.12
T3(Imaze. 80g/haPRE)	1.48(2)	1.77(3)	0.80(0.15)	2.09(4)	2.36(5)	0.71(0)	94.79	93.55
T4(Imaze. 50g/haPOE)	3.42(11)	5.11(26)	2.55(6.00)	3.45(11)	7.77(60)	2.43(5)	50.82	46.07
T5(Imaze. 70g/haPOE)	3.31(10)	4.36(19)	1.68(2.35)	3.11(9)	6.17(38)	1.79(3)	64.49	65.61
T6(Imaze. 80g/haPOE)	2.39(5)	3.15(9)	1.01(0.51)	2.39(5)	3.86(15)	0.75(0)	82.72	86.06
T7 (Imaze. + Imazemox 50g/haPRE)	3.52(12)	5.72(32)	3.79(13.87)	3.48(12)	7.89(63)	2.64(6)	34.27	43.69
T8 (Imaze. + Imazemox 70g/haPRE)	2.3(5)	3.00(9)	0.93(0.37)	2.28(5)	3.70(14)	0.75(0)	84.54	86.94
T9 (Imaze. + Imazemox 80g/haPRE)	1.94(3)	2.85(8)	0.87(0.27)	2.26(5)	3.41(11)	0.71(0)	87.19	88.44
T10 (Imaze. + Imazemox 50g/haPOE)	2.83(8)	3.45(11)	1.19(0.91)	2.58(6)	3.87(15)	0.78(0)	77.07	84.40
T11 (Imaze. + Imazemox 70g/haPOE)	1.26(1)	1.32(1)	0.71(0.01)	1.79(3)	1.91(3)	0.71(0)	97.40	95.78
T12 (Imaze. + Imazemox 80g/haPOE)	0.85(0)	1.09(1)	0.71(0.00)	1.59(2)	1.52(2)	0.71(0)	98.88	97.26
T13 (Pendim. 1000g/haPRE)	1.58(2)	2.82(8)	0.86(0.23)	2.13(4)	3.12(9)	0.71(0)	88.93	90.79
T14 (Imaze. + Pendi.1000g/ha)	3.03(9)	4.11(17)	1.61(2.10)	2.80(7)	4.99(24)	0.85(0)	69.22	77.42
T15 (Hoeing twice)	2.99(8)	3.77(14)	1.49(1.73)	2.62(6)	4.19(17)	0.83(0)	72.64	82.07
T16 (weedy check)	4.60(21)	7.23(52)	4.06(16.03)	4.35(18)	10.92(119)	3.08(9)	0.00	0.00
S.Em±	0.14	0.19	0.08	0.08	0.36	0.07	2.35	2.84
CD=(0.05)	0.42	0.57	0.23	0.23	1.07	0.22	7.02	8.47
CV%	9.38	9.07	8.18	5.04	12.70	9.73	5.78	6.75

\*Data in parenthesis were transformed to  $\sqrt{x+0.5}$  before analysis

**Table 3:** Yield attributes and yield of blackgram as influenced by weed control method in black gram crop.

Treatments	No. of pod/Plant	No. of seed/Pod	1000 Seed wt.(g)	Yield
T1(Imaze. 50g/haPRE)	13	7	33.22	884
T2(Imaze. 70g/haPRE)	14	7	33.90	929
T3(Imaze. 80g/haPRE)	18	7	36.53	1103
T4(Imaze. 50g/haPOE)	13	7	32.62	880
T5(Imaze. 70g/haPOE)	13	7	33.38	922
T6(Imaze. 80g/haPOE)	15	6	34.72	1020
T7 (Imaze. + Imazemox 50g/haPRE)	10	7	31.73	861
T8 (Imaze. + Imazemox 70g/haPRE)	17	7	35.43	1020
T9 (Imaze. + Imazemox 80g/haPRE)	17	7	35.27	1069
T10 (Imaze. + Imazemox 50g/haPOE)	15	7	34.45	961
T11 (Imaze. + Imazemox 70g/haPOE)	19	7	37.17	1109
T12 (Imaze. + Imazemox 80g/haPOE)	19	7	38.12	1129
T13 (Pendim. 1000g/haPRE)	16	7	36.27	1084
T14 (Imaze. + Pendi.1000g/ha)	15	6	33.72	946
T15 (Hoeing twice)	15	6	33.97	952
T16 (weedy check)	10	6	31.38	661
S.Em±	0.97	0.28	0.76	36
CD=(0.05)	2.88	0.83	2.26	107
CV%	11.29	7.23	3.80	6

## Conclusion

Growth and productivity of blackgram crop differed significantly due to different pre and post emergence herbicides and their combinations. Application of Imazethapyr+ Imazamox 80g/ha as post emergence was most effective weed control methods most efficient in reducing weed density and dry weight as well as better crop growth, higher yield of blackgram.

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