



Evaluation of post emergence herbicides on grass weeds in pigeon pea and its bioassay on following crop

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ABSTRACT

A Field experiment was conducted at Agricultural Research Station, Malnoor (UAS, Raichur) during *Kharif* of 2012-13 and 2013-14 to study the post emergence herbicides on the control of grassy weeds in pigeon pea and its residual effect on the following pigeon pea. The experiment consists of eight treatments viz, propaquizafop 10 EC @ 0.05, 0.062, 0.10 and 0.125 kg/ha, phenoxaprop-p-ethyl 9.3 % at 0.10 kg/ha and imazethapyr at 0.075 kg/ha applied at 2 to 7 leaf stage of grassy weeds. These treatments were compared with hand weeding twice at 20 and 40 days after sowing and weedy check. The data revealed that Imazethapyr @ 0.075 kg/ha and hand weeding recorded the highest grain yield of 1683 kg/ha and 1521 kg/ha, respectively. The next best treatment was propaquizafop @ 0.062 kg/ha (1372 kg/ha) and further increase in the dose did not had any beneficial effect. These treatments controlled both the monocot weed species, *Dinebra retroflexa* and *Echinochloa colonum* very effectively and had no residual effect on the following pigeon pea.

Key words : Bioassay, Pigeon pea and Post emergence herbicides.

INTRODUCTION

Pigeon pea (*Cajanus cajan* L.) is one of the protein rich legume grown both under irrigated and rain fed conditions. The crop occupies an area of 4.05 million hectares producing 3.27 million tonnes with an average productivity of 799 kg/ha. In Karnataka, It covers an area of 0.59 million hectares with a productivity of 467 kg/ha. Pigeon pea being a medium to long duration crop posed serious problems in the cultivation. In Karnataka, pigeon pea is grown as a mono crop, that is generally sown in June-July and needs inter cultivation to control weeds during August. But due to heavy and continuous rainfall during August, it becomes very difficult to go for inter cultivation in time. The only option and commonly followed method is hand weeding but incessant rains and high cost and not availability of labours at peak periods are the main constrains in controlling weeds in time that reduces yield (Vyas and Kushwah, 2008). Further, very slow growth of pigeon pea during early stages aggravated the ill effect. Amongst different monocot weeds, *Dinebra retroflexa*, *Echinochloa colonum* are the major weeds notice in the UKP area of Karnataka. Hence, it is necessary to tackle the situation with the appropriate post emergent application of herbicides. Therefore, the present investigation was undertaken to study the efficiency of post emergence herbicides for controlling weeds in pigeon pea and its residual effect on the following pigeon pea crop.

MATERIALS AND METHODS

A field experiment was conducted at Agricultural Research Station, Malnoor during *kharif* seasons of 2012-13

and 2013-14. The experiment was laid out in randomized block design with three replications. The soil was shallow to medium deep black clay with pH 8.1, having 243 kg N, 34 P₂O₅ and 292 K₂O per ha. There were seven treatments namely propoquizaafop 10% tried at 0.050, 0.062, 0.10 and 0.125 kg/ha, phenoxaprop-p-ethyl 9.3 % at 0.10 kg/ha and imazethapyr at 0.075 kg/ha applied at 2 to 7 leaf stage of grassy weeds. These treatments were compared with hand weeding twice at 20 and 40 days after sowing and weedy check. The herbicides were sprayed using knapsack sprayers and the spray volume was 500 liter ha⁻¹. The pigeon pea genotype TS- 3R was sown by giving a spacing of 60 X 20 cm. A fertilizer dose of 25: 50:0 NPK kg/ha was applied all at sowing in the form of diammonium phopshate. The gross plot and net plot sizes were 5.4 m X 5.0 m and 3.0 m X 4.0 m, respectively. The other agronomic practices were carried out as per the recommendation. The data on weed population and dry weight was recorded at 15 days after spraying post emergent herbicides with quadrat measuring 50 X 50 cm and expressed in m². The data was subjected to $\sqrt{1+x}$ transformation and statistically analyzed as suggested by Gomez and Gomez (1984), weed control efficiency by Mani *et.al.* (1976) and weed index by Gill and Kumar (1969).

After the harvest of the crop, soil sample at 0-15 cm was collected at random in each plot, air dried and powdered and distributed to pots as per the treatments. Known number seeds of pigeon pea were sown in each pot and germination per cent was recorded after 10 days.

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RESULTS AND DISCUSSION

Weed densities: *Dinebra retroflexa* and *Echinochloa colonum* were the major monocot weed floras noticed in the pigeon pea field. The population of these weeds were effectively reduced by herbicide application and hand weeding. The mean data over two years (2012-13 and 2013-14) revealed that application of imazethapyr @ 0.075 kg/ha reduced these weeds very effectively (1.1 /m²) closely followed by phenoxaprop-p-ethyl @ 0.10 kg/ha (1.1 /m²) and propaquizafop @ 0.062 kg/ha (1.3 /m²). Khan Bahadar Marwat, *et. al.* (2004) reported lower weed population in propaquizafop and hand weeding. This is in corroboration with Aggarwal Navneet *et. al.* (2014). Further increase in propaquizafop to 0.125 kg/ha (1.2 g/m²) had only marginal effect. All these treatments were on par with hand weeding confirming the efficiency of these herbicides. Application of propaquizafop @ 0.05 kg/ha though reduced the weed density (2.1 g/m²) but not to the required level. The weedy check recorded the highest weed density of 3.3 g/m². Similar results are obtained during both the years (Table 1).

Weed dry weight: The dry weight of weeds followed similar trend to that of weed density. The data indicated that hand weeding (1.00 g/m²), application of imazethapyr (1.01 g/m²), phenoxaprop-p-ethyl (1.02 g/m²), propaquizafop @ 0.062 kg/ha (1.07 g/m²) to 0.125 kg/ha (1.08 g/m²) were on

par with each other but significantly superior over propaquizafop @ 0.05 kg/ha (1.69 g/m²) and weedy check (2.77 g/m²). This was mainly due to the efficiency of these herbicides to control the weeds and propaquizafop @ 0.05 kg/ha was not sufficient to bring down the weed dry weight.

‘The weed control efficiency was highest in hand weeding (100 %) closely followed by phenoxaprop-p-ethyl (99.7%) and imazethapyr (99.2 %). The WCE was only 72.8 % at propaquizafop @ 0.05 kg/ha (1.69 g/m²) and considerably increased at propaquizafop @ 0.062 kg/ha (98.3%) and further increase to dose 0.125 kg/ha had no effect indicating 0.062 kg/ha is optimum.

The weed index represents the yield reduction as compared to the highest yielding treatment. In the present investigation, imazethapyr being the highest yielding treatment was used for the estimation of weed index. The study showed the lowest weed index in hand weeding (9.6 %) followed by propaquizafop @ 0.062 kg/ha (18.4%). This may be attributed to the better weed control in these treatments that favored the growth of the crop which increased the grain yield of pigeon pea. The weedy check recorded the highest weed index of 46.3 % and the next was propaquizafop @ 0.05 kg/ha (40.5%) confirming propaquizafop @ 0.05 kg/ha was not sufficient to keep the weed intensity low.

Table 1: Weed count and weed dry weight at 15 Days after spraying as influenced by different treatments.

Tr. Nos.	Weed count m ²			Dry wt m ²			WCE%	WI%	Germination %
	2012-13	2013-14	Mean	2012-13	2013-14	Mean			
Propaquizafop @ 0.05 kg/ha	1.90 (2.67)	2.23(4.00)	2.1(3.33)	1.55 (4.25)	1.83(2.37)	1.69 (3.31)	72.8	40.5	85.3
Propaquizafop @ 0.062 kg/ha	1.14 (0.33)	1.41(1.00)	1.3(0.66)	1.03 (0.20)	1.11(0.23)	1.07(0.21)	98.3	18.5	85.7
Propaquizafop@ 0.100 kg/ha	1.28 (0.67)	1.28(0.67)	1.3(0.67)	1.03 (0.20)	1.07(0.17)	1.05(0.18)	98.5	19.8	89.0
Propaquizafop @ 0.125 kg/ha	1.14 (0.33)	1.28(0.67)	1.2(0.50)	1.05 (0.30)	1.12(0.27)	1.08(0.29)	97.6	20.7	82.3
Phenoxaprop-p-ethyl@ 0.100 kg/ha	1.00 (0.00)	1.14(0.33)	1.1(0.16)	1.00 (0.00)	1.03(0.07)	1.02(0.03)	99.7	31.2	87.3
Weedy check	3.48 (11.67)	4.04(15.33)	3.3(13.5)	2.46 (15.70)	3.09(8.63)	2.77(12.16)	0.00	46.3	83.7
Hand weeding (twice)	1.00 (0.00)	1.00(0.00)	1.1(0.00)	1.00 (0.00)	1.00(0.00)	1.00(0.00)	100.0	9.6	89.7
Imazethapyr@ 0.075 kg/ha	1.10(0.3)	1.00(0.00)	1.2(0.15)	1.03 (0.10)	1.00(0.00)	1.01(0.10)	99.2	0.0	84.0
SEm +/-	0.23	0.12	0.28	0.12	0.10	0.08	-	-	1.9
CD 0.05	0.71	0.36	0.85	0.38	0.32	0.25	-	-	NS

Table 2: Grain yield of pigeon pea and its attributes as influenced by different treatments.

Tr. Nos.	Branches/ plant			pods/ plant			100 seed wt (g)			Grain yield (kg/ha)		
	2012-13	2013-14	Mean	2012-13	2013-14	Mean	2012-13	2013-14	Mean	2012-13	2013-14	Mean
1	15.20	8.00	11.6	80.20	59.40	69.8	10.33	10.43	10.4	1111	892	1001
2	20.67	9.27	15.0	96.73	77.13	86.9	11.17	11.37	11.3	1528	1217	1372
3	18.17	8.47	13.3	85.37	72.00	78.7	11.33	11.40	11.4	1417	1279	1349
4	17.57	9.00	13.3	84.90	69.00	77.0	11.17	11.43	11.3	1444	1225	1335
5	18.83	8.00	13.4	84.83	59.57	72.2	11.33	11.53	11.4	1375	942	1158
6	13.80	7.20	10.5	68.07	55.67	61.9	11.17	10.37	10.8	1083	721	903
7	20.80	9.73	15.3	95.53	80.87	88.2	10.83	11.30	11.1	1625	1417	1521
8	22.00	9.80	15.9	99.22	78.98	89.1	11.50	10.9	11.2	1789	892	1683
SEm +/-	1.12	0.43	0.67	3.83	5.26	3.1	0.32	0.27	0.2	110	92	75
CD 0.05	3.45	1.34	2.00	11.82	16.21	9.4	NS	0.82	0.6	330	283	227

Yield and its attributing characters: Imazethapyr @ 0.075 kg/ha and hand weeding recorded the highest grain yield of 1683 kg/ha and 1521 kg/ha, respectively and they were on par with each other but significantly superior over rest of the treatments. This increase was estimated to be 86.4 and 68.4 per cent, respectively over the unweeded check. Hemraj Dhaker, *et.al.* (2009) reported that imazethapyr @ 0.1 kg/ha with one hand weeding recorded efficient weed control, higher yield and economics. The next best treatment was propaquizafop @ 0.062 kg/ha (1372 kg/ha) that recorded 51.9 per cent higher yields over unweeded check. Further increase in the dose of propaquizafop on an above 0.062 kg/ha had no beneficial effect on weeds. The increase in these

treatments may be attributed to growth characters like branches per plant. This inturn helped in accommodating higher pods per plant. Weed less plots increased the up take of nutrients thus increased the test weight.

Residual effect: The statistical analysis of the data showed that the herbicidal application did not show any visual effect (Table 2).

CONCLUSION

It can be concluded from the study that the application of imazethapyr @ 0.075 kg/ha or propaquizafop @ 0.065 kg/ha is on par with two hand weeding and hence, it can be adopted to control presently existing monocot weeds at UKP command area of Karnataka.

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