Yield Improvement and Reducing weed Population through Herbicides in *kharif* Greengram (*Vigna radiata* L. Wilczek)

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ABSTRACT

A filed experiment was carried out during rainy season of 2009 at Agronomy Instructional Farm, C. P. College of Agriculture, S. D. Agricultural University, Sardarkrushinagar (Gujarat). Result revaluated that an application of Imazethapyr 100 g/ha at 15-20 DAS was found most effective in reducing all kind of weed population and recorded less dry weight of weeds (52.09 g/m^2) and it was closely followed by quizalofop-p-ethyl 100 g/ha at 15-20 DAS. Imazethapyr and Quizalofop-p-ethyl 100 g/ha at 15-20 DAS also recorded higher per cent mortality (74.52 and 64.44 %, respectively) and WCE (84.38 and 83.76 %, respectively). Imazethapyr and Quizalofop-p-ethyl 100 g/ha at 15-20 DAS were found equally effective in grain and straw yield over other treatments. IC and HW at 20 & 40 DAS was found statistically at par in these parameters. Imazethapyr and Quizalofop-p-ethyl 100 g/ha at 15-20 DAS recorded 242 and 239 % higher grain yield as compared to unweeded control respectively, while these were 24.43 and 23.49 % higher as compared to Pendimethalin 1.0 kg/ha as PE, respectively.

Keywords: Green gram, Imazethapyr, Quizalofop-p-ethyl, Pendimethalin, IC and HW, Grassy, Broad leaves, Sedges, Dry weight of weeds and Grain yield

1. INTRODUCTION

Among the pulses, green gram is one of the most important and extensively cultivated pulse crops. Weed management is an important key factor for enhancing the productivity of green gram, as weeds compete for nutrient, water, light and space with crop plant during early growth period. Yield losses in green gram due to weeds have been estimated to range between 30-50 % (Vats and Sidhu 1976). Weeds allowed to grow throughout the crop season caused 42% reduction in green gram yield (Kumar *et al.* 2004). Mechanical practices such as hand weeding and interculturing are effective but unavailability of labors and continues rainfall in rainy season does not permit it to operate timely in kharif greengram crop. The current trends and further development of intensive agriculture likely to seek the help of herbicide as an effective tool for weed control. Due to limited scientific information about the effect of herbicides on yield and weed population in *kharif* Greengram, the study was planed.

2. MATERIAL AND METHODS

A filed experiment was carried out during rainy season of 2009 at Agronomy Instructional Farm, C. P. College of Agriculture, S. D. Agricultural University, Sardarkrushinagar (Gujarat). The soil of the test site was sandy loam in texture, low in organic carbon (0.15 %), acidic/basic in reaction (7.9 pH) and low in available N (168 kg/ha), medium in P (32.4 kg/ha) and high in K (234 kg/ha). Nine treatments of weed control were evaluated (Table 2) in randomized block design, replicated four times with variety GM-4. Pre-emergence herbicides *Viz.* pendimethalin and imazethapyr were applied just after sowing, while, post emergence herbicides *viz.* Quizalofop-p-ethyl and imazethapyr were sprayed at 17 DAS. Interculturing and hand weeding were carried out at 20 & 40 DAS. Total weed population was counted 15 DAS, 40 DAS and at harvest. Dry weight of weeds was recorded at harvest. Percent mortality of weeds and weed control efficiency were calculated from the related observations. The observations on yield and yield parameters were also recorded at harvest.

3. RESULTS AND DISCUSSION

During the present investigation, weed species were found in the experimental field are listed in Table 1. There were ten different types of weeds which found in green gram crop and which were counted at 15, 40 DAS and at harvest during the investigation as total weeds.

Data (Table 2) indicated that lowest total weeds (grassy weeds, broad leaves weeds and sedge weeds) recorded at 15 and 40 DAS as well as at harvest were significantly affected by different treatments. Besides treatment T_8 (weed free), treatment T_1 (pendimethalin 1.0 kg/ha PE) recorded minimum number of total weeds (7.6 per m^2) at 15 DAS followed by T_5 (imazethapyr 100 g/ha PE). At 40 DAS, except T_8 (weed free), lowest total weeds (9.1 per m^2) was recorded under treatment T_6 (imazethapyr 100 g/ha at 15-20 DAS) closely followed by T_4 (quizalofop-p-ethyl 100 g/ha at 15-20 DAS) and T_1 (pendimethalin 1.0 kg/ha PE). While at harvest, lowest total weeds was recorded under treatment T_8 (weed free), besides this IC and HW at 20 & 40 DAS recorded lowest total weeds at harvest (10.8 per m^2) closely followed by T_6 (imazethapyr 100 g/ha at 15-20 DAS), T_4 (quizalofop-p-ethyl 100 g/ha at 15-20 DAS) and T_1 (pendimethalin 1.0 kg/ha PE).

The highest percent mortality of weeds as well as WCE was recorded by imazethapyr 100 g ha^{-1} at 15-20 DAS and closely followed by quizalofop-p-ethyl 100 g ha^{-1} at 15-20 DAS and IC and HW at 20 & 40 DAS. Dry weight of weeds was reduced in all the weed control treatments as compared to unweeded control. Except weed free (T_8), treatment T_6 (imazethapyr 100 g/ha at 15-20 DAS) was emerged out as more effective in minimizing weed infestation and recorded significantly less dry weight of weeds (Table 2) among the weed management treatments tried out in this experiment. These findings are close conformity with those reported by Mishra *et al.* (2004) and Begum and Rao (2006).

Significantly highest grain yield of green gram (999 kg/ha) was recorded under treatment T_8 (weed free). Among other treatments, treatment T_6 (imazethapyr 100 g/ha at 15-20 DAS), T_4 (quizalofop-p-ethyl 100 g/ha at 15-20 DAS), T_7 (interculturing and hand weeding at 20 & 40 DAS) and T_1 (pendimethalin 1.0 kg/ha PE) recorded statistically similar seed yield of green gram. Increase in seed yield of green gram under treatments T_8, T_6, T_4, T_7 and T_1 over T_9 (unweeded control) was to the tune of 269, 242, 240, 236 and 175 per cent, respectively**.** The per cent increase in seed yield under T_8, T_6, T_4 and T_7 over T_1 was 34, 24, 24 and 22 per cent, respectively. Higher seed yield obtained under these treatments might be due to the maintenance of weed free environment, especially during critical growth stages of crop growth as evident from increase in the values of yield attributes under these treatments. In addition to this the least weed population and dry weight of weeds were recorded under these treatments are also responsible for better seed yield. These findings are in accordance with those reported by Parasuraman (2000) and Kumar *et al.* (2004).

Significantly the highest value of straw yield (1094 kg/ha) (Table 2) was observed under treatment T_8 (weed free), which was at par with treatments T_6 (imazethapyr 100 g/ha at 15-20 DAS), T_4 (quizalofop-p-ethyl 100 g/ha at 15-20 DAS), T_7 (interculturing and hand weeding at 20 & 40 DAS) and T_1 (pendimethalin 1.0 kg/ha PE). Favourable effect on growth characters by avoiding crop weed competition is responsible for higher straw yield under these treatments.

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Table 1 : List of weed flora found in experiment

Sr. No.	Local name	Scientific Name	Family
[A]	Grassy weeds		
1.	Dharo	*Cynodon dactylon* (L.) Pers.	Gramineae
2.	Bhanth	*Cenchrus biflorus* L.	Gramineae
3.	Chokadiyu	*Dactylocatenium aegyptium*	Gramineae
[B]	Broad leaved weeds		
1.	Satodi	*Boerhavia diffusa* L.	Nyctaginaceae
2.	Satodo	*Trianthema monogyna* L.	Atzoaceae
3.	Kagadasingh	*Corchorus olitorius* L.	-
4.	Luni	*Portulaca oleracea* L.	Portulaceae
5.	Gokharu	*Tribulus terrestris* L.	Zygophyllaceae
6.	Munmuna	*Spergula arvensis* L.	-
[C]	Sedge weeds		
1.	Chidho	*Cyperus rotundus* L.	Cyperaceae

Table 2. Effect of different treatments on weed population at 15, 40 DAS & at harvest, dry weight of weed and yield of rainy green gram.

Treatments	Weed population per m^2			Mortality of weeds (%)	WCE (%)	Dry weight of weeds (g/m^2)	Grain Yield (kg/ha)	% higher over T_9	% higher over T_1	Straw Yield (kg/ha)
	15 DAS	40 DAS	At harvest							
Pendimethalin 1.0 kg/ha PE	18.5 (7.6)*	33.4 (10.1)	46.8 (11.9)	0	79.06	70.05	745	175	0	823
Quizalofop-p-ethyl 50 g/ha at 15-20 DAS	61.7 (13.7)	50.8 (12.5)	64.2 (14.0)	23.53	42.05	193.71	430	59	- 42	508
Quizalofop-p-ethyl 75 g/ha at 15-20 DAS	62.3 (13.8)	43.5 (11.5)	55.4 (13.0)	40.92	69.41	101.97	536	98	-28	663
Quizalofop-p-ethyl 100 g/ha at 15-20 DAS	61.7 (13.8)	28.2 (9.4)	44.4 (11.7)	64.44	83.76	54.30	920	240	24	978
Imazethapyr 100 g/ha PE	22.2 (8.3)	50.8 (12.5)	64.2 (13.9)	0	78.72	71.29	629	132	-16	706
Imazethapyr 100 g/ha at 15-20 DAS	59.2 (13.4)	14.2 (9.1)	40.9 (11.2)	74.52	84.38	52.09	927	242	24	1036
Interculturing and Hand weeding at 20 & 40 DAS	60.3 (13.6)	48.1 (12.1)	38.1 (10.8)	-	84.28	52.59	910	236	22	927
Weed free	0 (0)	0 (0)	0 (0)	0	100.0	0.00	999	269	34	1094
Unweeded control	68.5 (14.1)	138 (20.4)	180.5 (23.1)	0	0.00	336.25	271	0	-64	318
S.Em. ±	0.59	0.59	0.79	-	1.10	4.93	32.48	--	--	77.73
C. D. at 0.05 %	1.76	1.74	2.35	-	3.23	14.41	94.82	--	--	226.90
C. V. (%)	10.59	11.38	12.23	-	3.21	9.53	9.18	--	--	19.83

DAS= Days after sowings, PE= Pre-emergence, WCE= Weed control efficiency

** Original data given in parentheses were subjected to square root transformation ($\sqrt{x + 0.5}$) before analysis.*