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Phytotoxicity Ratings and Weed Control Ratings as Influenced by Chemical Weed Control Treatments in Greengram (*Vigna radiata* L.)

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ABSTRACT

The field experiment was conducted during the kharif season 2013-14 at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad to investigate the "Phytotoxicity ratings and weed control ratings as influenced by weed control treatments in greengram (Vigna radiata L.)". The experiment was laid out in Randomized Complete Block Design with three replications and ten treatments. The crop toxicity rating observed at 7, 14 and 21days after pre emergence herbicides application revealed that none of the herbicide dose had any injury on the crop growth and the crop was grown normally. The application of post-emergence herbicides treatments T_4, T_6 and T_8 showed the phytotoxicity effect on the crop at seven and 14 days after spray. The rest of the treatments recorded no phytotoxicity injury on the crop. However, the crop recovered completely after 21 days after spray. All the pre-emergence herbicide application treatments T_1, T_2, T_5, T_6, T_7 and T_8 recorded good to excellent control of weeds at 7 days after spray and good control at 14 days after spray. At 21 days after spray, T_1 and T_6 treatments were recorded good control of weeds, while the treatments T_2, T_5, T_7, T_8 and farmers practice observed satisfactory control of weeds.

Key words: *Greengram, Herbicide, Sequential application, Weed.*

INTRODUCTION

Greengram [*Vigna radiata* (L.) Wilczek] is the third most important pulse crop of India only after chickpea and pigeonpea and is preferred due to its high quality protein. In India it is grown in an area of about 3.55 m ha with a total production 1.33 mt and average productivity of 374 kg per hectares. In Karnataka it occupies an area of 0.52 m ha with a total production of 0.11 m t and an average productivity of only 204 kg per ha[1]. Weed competition is one of the major biotic constraints in realising higher greengram productivity under rainfed conditions due to continuous and incessant rains during *kharif* season.

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However, in many instances weeds flourish even after critical period of crop-weed competition and it is difficult to control these weeds through cultural operation due to unfavorable conditions. Uncontrolled weed growth reduced the seed yield of greengram up to an extent of 30-50 per cent[3]. The progressive modernization of agriculture involving intensive use of herbicides is gaining popularity in recent years due to its lower cost, easy and timely application and effectiveness in controlling the weeds[2].

MATERIAL AND METHODS

The field experiment was conducted during the *kharif* season of 2013 to study the "Phytotoxicity ratings and weed control ratings as influenced by weed control treatments in greengram (*Vigna radiata* L.)". At Main Agricultural Research Station, University of Agricultural Sciences, Dharwad (Karnataka) situated at 15°26' N latitude, 75°07' E longitude and at an altitude of 678 m above mean sea level. The experiment was laid out on black clay soil (vertisols). The initial soil pH was 7.4 and was low in available nitrogen (237.6 kg ha^{-1}), medium in available phosphorus (30.6 kg ha^{-1}) and high in available potassium (364.9 kg ha^{-1}). The experiment laid out in Randomized Complete Block Design with three replications. It comprised of ten treatments *viz.*, T_1- Pendimethalin 30EC @ 1kg a.i ha^{-1} (PE); T_2-Pendimethalin 38.7 CS @ 0.7kg a.i ha^{-1} (PE); T_3- Imazethapyr @ 75g a.i ha^{-1} (PoE); T_4- Imazethapyr @ 100g a.i ha^{-1} with adjuvant (PoE); T_5-Pendimethalin 30EC @ 1kg a.i ha^{-1} (PE) fb Imazethapyr @ 75g a.i ha^{-1} (PoE); T_6- Pendimethalin 30EC @ 1kg a.i ha^{-1} (PE) fb Imazethapyr @ 100g a.i ha^{-1} with adjuvant (PoE); T_7-Pendimethalin 38.7 CS @ 0.7kg a.i ha^{-1} (PE) fb Imazethapyr @ 75g a.i ha^{-1} (PoE); T_8-Pendimethalin 38.7 CS @ 0.7kg a.i ha^{-1} (PE) fb Imazethapyr @ 100g a.i ha^{-1} with adjuvant (PoE); T_9-Farmers practice (1IC + 1HW); T_{10}- Weedy check. The crop was sown on 20-06-2013 with 30 cm X 10 cm spacing. The chemical fertilizers were applied as per recommended package of practices. Total rainfall received during crop season (June-September) was 484 mm. The growth attributes were recorded on five randomly selected plants in each net plot at 30, 60 DAS and at harvest. Pre-emergence herbicides (Pendimethalin 30EC 1.0 kg ai ha^{-1}, Pendimethalin 38.7CS 0.7 kg ai ha^{-1}) were sprayed next day after sowing. Post-emergence herbicides (Imazethapyr 10%SL 75 g ai ha^{-1}, (Imazethapyr 10%SL 100 g ai ha^{-1},) were sprayed at 25 Days after sowing (DAS) with knapsack sprayer using 750 liters of spray solution per hectare.

RESULTS AND DISCUSSION

Weed flora observed in greengram

The weed flora noticed in the experimental site comprised of grasses, sedges and broad leaved weed category. The important grassy weeds observed were *Cynodon dactylon and Dinebra retroflexa*; among broad-leaved weeds, *Ageratum conyzoides*, *Amaranthus viridis, Commelina benghalensis*, *Corchorus olitorius, Cyanotis cucculata, Euphorbia geniculata, Mollugo disticha, Phyllantus niruri*, *Portulaca oleracea* and *Parthenium hysterophorus* and among sedges *Cyperus rotundus* was observed.

Crop phytotoxicity rating as influenced by sequential application of herbicides

The crop toxicity rating observed at 7, 14 and 21days after spray of pre emergence herbicides revealed no injury on the crop growth (Table 2). Similar results were found with Ratnam *et al*[6]., who reported no crop injury was observed with the pre emergence herbicides applied under the study.

The crop toxicity rating was observed at 7, 14 and 21 days after spray of post-emergence herbicides noticed no injury on the crop growth except imazethapyr @ 100 g a.i ha^{-1} with adjuvant, pendimethalin 30EC @ 1kg a.i ha^{-1} fb Imazethapyr @ 100 g a.i ha^{-1} with adjuvant and pendimethalin 38.7CS @ 0.7 kg a.i ha^{-1} fb Imazethapyr @ 100 g a.i ha^{-1} with adjuvant. Seven days after spray, there was some stand loss, stunting or discolouration of leaves (2.00 on 10 points scale) was observed with imazethapyr @ 100 g a.i ha^{-1} with adjuvant, pendimethalin 30EC @ 1kg a.i ha^{-1} fb Imazethapyr @ 100 g a.i ha^{-1} with adjuvant and pendimethalin 38.7CS @ 0.7 kg a.i ha^{-1} fb

Imazethapyr @ 100 g a.i ha^{-1} with adjuvant. At 14 days after spray, slight stunting, injury or discolouration (0.67-1.00 on 10 points scale) was observed in T_4, T_6 and T_8 treatments. However, the crop recovered completely after 21days after spray of herbicides. It is might be due to higher dose of post-emergence herbicide imazethapyr which showed the pytototoxic effect on the greengram. The result is in conformity with the findings of Mishra *et al*[4]., who reported that post emergence application of imazethapyr (100 g a.i ha^{-1}) showed the phytotoxicity effect on the blackgram but recovered subsequently. Similar findings were also reported by Rao and Rao[5].

Weed control rating as influenced by chemical weed control treatments

Visual observations on weed control rating showed marked differences among the different weed control treatments (Table 3). Application of pre-emergence herbicides *i.e.* pendimethalin at seven days after spray recorded good to excellent control of weeds in T_1, T_2, T_5, T_6, T_7, T_8 treatments. At 14 days after spray good control of weeds was observed in all pre-emergence herbicides treatments. At 21 days after spray, good control of weeds was observed in T_1 and T_6 treatments. The treatments such as T_2, T_5, T_7 and T_8 observed satisfactory control of weeds.

The weed control rating observed at seven days after spray of post-emergence herbicides noticed that, good to excellent (8-10 on 10-point scale) control of weeds in imazethapyr (T_3, T_4, T_9, T_6, T_7 and T_8) treated plots. At 14 days after spray, all the post-emergence herbicide treatments maintained good to excellent control of weeds except T_3. Imazethapyr @ 75g a.i ha^{-1} (T_3) recorded satisfactory control of weeds. At 21 days after spray, all the post-emergence herbicide treatments recorded moderate to good control of weeds (6-8 on 10-point scale).

CONCLUSION

Application of pre emergence herbicides there is no phytotoxicity effect on crop but higher dose of post-emergence herbicide imazethapyr which showed the pytototoxic effect on the greengram.

Application of pre emergence herbicides at seven DAS recorded good to excellent control, good control at 14 DAS and Satisfactory control at 21 DAS except T1 and T6 treatments. After post emergence spray at seven DAS recorded good to excellent control, 14 DAS recorded good to excellent control except T3 and 21 DAS recorded moderate to good control of weeds.

Table 1: Qualitative description of treatment effects on weeds and crop in the visual scoring scale of 0 to 10 (Rao, 1986)

Effect	Rating	Weed	Crop
None	0	No control	No injury , normal
Slight	1	Very poor control	Slight stunting, injury or discolouration
	2	Poor control	Some stand loss, stunting or discolouration
	3	Poor to deficient control	Injury more pronounced but not persistent
Moderate	4	Deficient control	Moderate injury, recovery possible
	5	Deficient to moderate control	Injury more persistent, recovery doubtful
	6	Moderate control	Near severe injury no recovery possible
Severe	7	Satisfactory control	Severe injury stand loss
	8	Good control	Almost destroyed a few plants surviving
	9	Good to excellent control	Very few plants alive
Complete	10	Complete control	Complete destruction

Table 2: Phytotoxicity ratings (0-10 scale) as influenced by weed control treatments in greengram

	Treatments	After pre emergence herbicides			After post emergence herbicides		
		7 DAS*	14 DAS*	21 DAS*	7 DAS*	14 DAS*	21 DAS*
T_1	Pendimethalin 30EC @ 1kg a.i ha^{-1} (PE)	0.00	0.00	0.00	0.00	0.00	0.00
T_2	Pendimethalin 38.7 CS @ 0.7kg a.i ha^{-1} (PE)	0.00	0.00	0.00	0.00	0.00	0.00
T_3	Imazethapyr @ 75g a.i ha^{-1} (PoE)	0.00	0.00	0.00	0.00	0.00	0.00
T_4	Imazethapyr @ 100g a.i ha^{-1} with adjuvant (PoE)	0.00	0.00	0.00	2.00	0.67	0.00
T_5	Pendimethalin 30EC @ 1kg a.i $^{-1}$ha (PE) fb Imazethapyr @ 75g a.i ha^{-1} (PoE)	0.00	0.00	0.00	0.00	0.00	0.00
T_6	Pendimethalin 30EC @ 1kg a.i ha^{-1} (PE) fb Imazethapyr @ 100g a.i ha^{-1} with adjuvant (PoE).	0.00	0.00	0.00	2.00	1.00	0.00
T_7	Pendimethalin 38.7 CS @ 0.7kg a.i ha^{-1} (PE) fb Imazethapyr @ 75g a.i ha^{-1} (PoE)	0.00	0.00	0.00	0.00	0.00	0.00
T_8	Pendimethalin 38.7 CS @ 0.7kg a.i ha^{-1} (PE) fb Imazethapyr @ 100g a.i ha^{-1} with adjuvant (PoE)	0.00	0.00	0.00	2.00	0.67	0.00
T_9	Farmers practice (1IC + 1HW).	0.00	0.00	0.00	0.00	0.00	0.00
T_{10}	Weedy check.	0.00	0.00	0.00	0.00	0.00	0.00

*DAS - Days after spray, IC – Inter Cultivation, HW - Hand Weeding, fb- Followed by, PE - Pre- Emergence, POE – Post-Emergence.

Table 3: Weed control ratings (0-10 scale) as influenced by weed control treatments in greengram

	Treatments	After pre emergence herbicides			After post emergence herbicides		
		7 DAS*	14 DAS*	21 DAS*	7 DAS*	14 DAS*	21 DAS*
T_1	Pendimethalin 30EC @ 1kg a.i ha^{-1} (PE)	9.00	8.00	7.67	7.00	6.67	6.00
T_2	Pendimethalin 38.7 CS @ 0.7kg a.i ha^{-1} (PE)	8.67	8.00	7.33	7.00	6.33	6.00
T_3	Imazethapyr @ 75g a.i ha^{-1} (PoE)	5.00	3.67	3.00	8.00	7.00	6.33
T_4	Imazethapyr @ 100g a.i ha^{-1} with adjuvant (PoE)	4.67	4.33	3.67	8.33	7.67	6.67
T_5	Pendimethalin 30EC @ 1kg a.i $^{-1}$ha (PE) fb Imazethapyr @ 75g a.i ha^{-1} (PoE)	9.00	8.33	7.33	9.00	8.67	8.00
T_6	Pendimethalin 30EC @ 1kg a.i ha^{-1} (PE) fb Imazethapyr @ 100g a.i ha^{-1} with adjuvant (PoE).	9.00	8.00	8.00	9.33	9.00	8.33
T_7	Pendimethalin 38.7 CS @ 0.7kg a.i ha^{-1} (PE) fb Imazethapyr @ 75g a.i ha^{-1} (PoE)	8.67	8.00	7.33	8.67	8.33	8.00
T_8	Pendimethalin 38.7 CS @ 0.7kg a.i ha^{-1} (PE) fb Imazethapyr @ 100g a.i ha^{-1} with adjuvant (PoE)	9.00	8.00	7.33	9.00	8.67	8.33
T_9	Farmers practice (1IC + 1HW).	8.00	8.00	7.33	9.00	8.33	8.00
T_{10}	Weedy check.	0.00	0.00	0.00	0.00	0.00	0.00

*DAS - Days after spray, IC – Inter Cultivation, HW - Hand Weeding, fb- Followed by, PE - Pre- Emergence, POE – Post-Emergence.

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