

Response of Post Emergence Herbicide against Grassy Weed Flora in Cotton

Harphool Meena*, P. K. P. Meena, R. S. Narolia and B. L. Kumhar

AICRP on Irrigation Water Management, Agricultural Research Station, Ummedganj Farm Agriculture University, Kota-324001, Rajasthan

*Corresponding Author E-mail: hpagron@rediffmail.com

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ABSTRACT

A field experiment was conducted during two consecutive years of kharif 2011 and 2012 at ARS, Banswara to evaluate bio efficacy of clethodim 24% EC against grassy weed flora of cotton. The experiment was laid-out in Randomized Block Design with three replications having ten treatments and revealed that, the application of post emergence herbicide clethodim 24% EC @ 60 g a. i. ha⁻¹ + NIS + AMS at 15-20 DAS was effective in controlling grassy weeds in cotton resulting in to increased bolls plant⁻¹ (30.63) and boll weight (4.38 g), seed cotton yield (2178 kg/ha) over control but it was found at par with weed free check, clethodim 24% EC @ 48 g a.i. ha⁻¹ + NIS + AMS, pendimethalin 30% EC @ 0.75 kg a. i. ha⁻¹, fenoxaprop-P-Ethyl 9.3% EC @ 50 g a.i. ha⁻¹, respectively. Application of clethodim 24% EC @ 60 g a. i. ha⁻¹ + NIS + AMS at 15-20 DAS were recorded lowest weed population (20.33 and 21.93 m⁻²), lowest weed dry matter accumulation (14.88 and 15.03 g m⁻²) and higher weed control efficiency (50.14 and 61.61 per cent) at 30 and 60 DAS in the pooled analysis.

Key words: Cotton, Clethodim Herbicide, Weed Control Efficiency and Weed Index.

INTRODUCTION

Cotton (*Gossypium spp* L.) is one of the predominant fibre crops and plays a pivotal role in agriculture, industrial development, employment generation and economic development of India. It is also called as "King of Fibres" and "White Gold" due to higher economical value among all cash crops in India. Cotton is gradually assuming the status of a preferred fibre even for fashion fabrics. Cotton cultivation needs to be sustainable, offering livelihood security to millions of

people in the country. In India an estimated 4 million farmers and about 60 million people depend on cotton production and textile industry to make their livelihood. Cotton is the most important cash and commercial crop contributing nearly 75 per cent of total raw material needs of textile industry in India. Textile industry is the number one export enterprise in the country earning revenue of over \$ 8.5 billion. Hence, it is also called as 'White Gold', and plays a vital role in the economic development of the country.

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In India, cotton is an important commercial crop supporting the livelihood of about 7.7 million farmers. Cotton occupies an area of 12.25 million ha of which 11.6 million ha (94 per cent) is genetically modified cotton (*Bt* cotton)³. India is the second largest exporter of cotton⁴. In the last seven decades that cotton has been grown, production and productivity have steadily increased. However, in the last few years it appears to have reached a plateau. Current production is about 39 million bales³.

Cotton is a long duration crop and typically takes about 140-160 days to complete its life cycle. Throughout the growth cycle it is exposed to weeds and the competition therein. Every crop has a critical period of weed control, which refers to the minimum time period during which the crop must be weed free. In cotton, the critical period of weed control is the first 15 to 60 days¹.

Maximum seed cotton yield can be derived when there is at least 95 per cent weed control⁶. Yield in cotton is dependent on the climatic conditions, rainfall pattern, weed competition and incidence of pests and diseases. Weeds are a potential problem in cotton cultivation and reduce yield by 50 to 85 per cent depending upon the nature and intensity⁵.

MATERIAL AND METHODS

A field experiment was conducted during two consecutive years of *kharif* 2011 and 2012 at ARS, Banswara to evaluate the bio efficacy of clethodim 24% EC herbicide against grassyweed flora in cotton. The experimental field was well prepared by two ploughing followed by harrowing & cultivator and one planking for uniform leveling were performed for sowing of cotton. The experiment was laid-out in Randomized Block Design with three

replications having ten treatments i.e. T₁ : Clethodim 24% EC @ 36 g a. i. ha⁻¹ + NIS + AMS, T₂: Clethodim 24% EC @ 48 g a.i. ha⁻¹ + NIS + AMS, T₃ : Clethodim 24% EC @ 60 g a.i. ha⁻¹ + NIS + AMS, T₄ : Clethodim 24% EC @ 48 g a.i. ha⁻¹ + NIS, T₅: Clethodim 24% EC @ 48 g a.i. ha⁻¹ + AMS, T₆ : Clethodim 24% EC @ 48 g a.i. ha⁻¹, T₇ : Fenoxaprop-P-Ethyl 9.3% EC @ 50 g a.i. ha⁻¹, T₈: Pendimethalin 30% EC @ 0.75 kg a.i. ha⁻¹ PE, T₉: Two hand weeding (weedy free check) and T₁₀: Untreated control. The soils of experimental sites were (black cotton soil) clay loam texture and alkaline in reaction (pH 7.9 and 7.8). The soil was medium in available nitrogen (245 and 253 kg/ha) and phosphorus (48.40 and 50.50 kg/ha) and high in available potassium (320 and 326 kg/ha).AMS-Ammonium sulphate (4 g/ per lit. water) and NIS-Non ionic surfactant (0.25 per cent).

RESULTS

Yield: It is evident from data (Table 1) that application of post emergence herbicide clethodim 24% EC @ 60 gha⁻¹ + NIS + AMS at 15-20 DAS was effective in controlling grassy weeds in cotton resulting in to significantly increased bolls plant⁻¹(30.63) and boll weight (4.38 g), seed cotton yield (2178 kg/ha) over weedy check control, clethodim 24% EC @ 36 g a.i. ha⁻¹ + NIS + AMS, clethodim 24% EC @ 48 g a.i. ha⁻¹ + NIS, clethodim 24% EC @ 48 g a.i. ha⁻¹+AMS, clethodim 24% EC @ 48 g a.i. ha⁻¹. However, it was found at par with weed free check, clethodim 24% EC @ 48 g a.i. ha⁻¹+ NIS + AMS, pendimethalin 30% EC @ 0.75 kg a. i. ha⁻¹, fenoxaprop-P-Ethyl 9.3% EC @ 50 g a.i. ha⁻¹, respectively. These results are in close proximity with those of Verma *et al.*⁸, Singh *et al.*⁷ and Chauhan & Yadav².

Table 1: Effect of clethodim 24% EC herbicide on seed cotton yield and yield attributes

Treatment	Bolls Plant ⁻¹			Boll weight (g)			Seed cotton yield (kg ha ⁻¹)		
	2010	2011	Pooled	2010	2011	Pooled	2010	2011	Pooled
Clethodim 24% EC @ 36 g a.i. ha ⁻¹ + NIS + AMS	23.20	25.26	24.23	3.63	3.95	3.79	1451	1580	1516
Clethodim 24% EC @ 48 g a.i. ha ⁻¹ + NIS + AMS	29.50	29.95	29.72	4.25	4.07	4.16	2050	2233	2142
Clethodim 24% EC @ 60 g a.i. ha ⁻¹ + NIS + AMS	30.54	30.72	30.63	4.68	4.08	4.38	2085	2271	2178
Clethodim 24% EC @ 48 g a.i. ha ⁻¹ + NIS	24.60	26.79	25.69	3.75	4.08	3.92	1885	2053	1969
Clethodim 24% EC @ 48 g a.i. ha ⁻¹ + AMS	25.00	27.23	26.11	3.80	4.14	3.97	1896	2064	1980
Clethodim 24% EC @ 48 g a.i. ha ⁻¹	26.00	28.31	27.16	3.70	4.10	3.90	1865	2031	1948
Fenoxaprop-P-Ethyl 9.3% EC @ 50 g a.i. ha ⁻¹	26.70	32.13	29.41	4.30	4.32	4.31	1920	2091	2006
Pendimethalin 30% EC @ 0.75 kg a. i. ha ⁻¹ PE	27.80	32.67	30.24	4.38	4.34	4.36	1927	2098	2013
Two hand weeding	32.00	34.30	33.15	4.70	5.12	4.91	2121	2309	2215
Weedy check control	18.00	19.60	18.80	3.25	3.54	3.39	1050	1144	1097
SEm ±	0.91	0.92	0.84	0.13	0.14	0.12	76	85	74
CD (P = 0.05)	2.70	2.75	2.47	0.40	0.42	0.37	225	251	223

Weed population: A perusal of data (Table 2) shows that under weedy check (control) was recorded maximum number of grassy weeds (53.40 and 78.34 m⁻²) at 30 and 60 DAS over weed free check, clethodim 24% EC @ 60 g ha⁻¹ + NIS + AMS and rest of herbicide treatments in the pooled analysis. Application of clethodim 24% EC @ 60 g a. i. ha⁻¹ + NIS +

AMS at 15-20 DAS was recorded lowest weed population (20.33 and 21.93 m⁻²) at 30 and 60 DAS over rest of herbicide treatments but it was found at par with clethodim 24% EC @ 48 g a.i. ha⁻¹ + NIS + AMS. These results are in close proximity with those of Choudhary and Gaur³, Singh *et al.*⁷.

Table 2: Effect of clethodim 24% EC herbicide on grassy weed population (m⁻²)

Treatment	30 DAS			60 DAS		
	2010	2011	Pooled	2010	2011	Pooled
Clethodim 24% EC @ 36 g a.i. ha ⁻¹ + NIS + AMS	25.00 (5.01*)	27.80 (5.28*)	26.40 (5.14*)	26.00 (5.11*)	28.31 (5.33*)	27.16 (5.22*)
Clethodim 24% EC @ 48 g a.i. ha ⁻¹ + NIS + AMS	18.00 (4.25*)	22.80 (4.78*)	20.40 (4.52*)	22.00 (4.70*)	22.04 (4.82*)	22.02 (4.80*)
Clethodim 24% EC @ 60 g a.i. ha ⁻¹ + NIS + AMS	18.65 (4.33*)	22.00 (4.70*)	20.33 (4.51*)	21.00 (4.59*)	22.87 (4.79*)	21.93 (4.69*)
Clethodim 24% EC @ 48 g a.i. ha ⁻¹ + NIS	21.00 (4.59*)	23.80 (4.89*)	22.40 (4.74*)	24.00 (4.91*)	26.14 (5.12*)	25.07 (5.01*)
Clethodim 24% EC @ 48 g a.i. ha ⁻¹ + AMS	22.50 (4.75*)	25.30 (5.04*)	23.90 (4.90*)	24.65 (4.97*)	26.84 (5.19*)	25.75 (5.08*)
Clethodim 24% EC @ 48 g a.i. ha ⁻¹	22.00 (4.70*)	24.80 (4.99*)	23.40 (4.85*)	24.00 (4.91*)	26.14 (5.12*)	25.07 (5.02*)
Fenoxaprop-P-Ethyl 9.3% EC @ 50 g a.i. ha ⁻¹	22.60 (4.72*)	25.40 (5.05*)	24.00 (4.90*)	22.30 (4.73*)	24.28 (4.94*)	23.29 (4.83*)
Pendimethalin 30% EC @ 0.75 kg a. i. ha ⁻¹ PE	23.00 (4.80*)	25.80 (5.09*)	24.40 (4.95*)	22.85 (4.79*)	24.88 (5.00*)	23.87 (4.89*)
Two hand weeding	5.00 (2.26*)	7.80 (2.81*)	6.40 (2.53*)	6.50 (2.57*)	7.08 (2.68*)	6.79 (2.62*)
Weedy check control	52.00 (7.22*)	54.80 (7.41*)	53.40 (7.31*)	75.00 (8.66*)	81.68 (9.04*)	78.34 (6.38*)
SEm ±	0.083	0.088	0.078	0.089	0.093	0.083
CD (P = 0.05)	0.247	0.263	0.240	0.267	0.278	0.251

*Value in parenthesis is square root transformed value of the respective value.

Dry matter accumulation: Pooled data (Table 3) shows that under weedy check (control) treatment was recorded significantly highest weed dry matter accumulation (29.90 and 41.84 g m⁻²) at 30 and 60 DAS over weed free check, clethodim 24% EC @ 60 g ha⁻¹ + NIS + AMS and rest of herbicide treatments in the pooled analysis. Application of post

emergence herbicide clethodim 24% EC @ 60 g a. i. ha⁻¹ + NIS + AMS at 15-20 DAS was recorded weed dry matter accumulation (14.88 and 15.03 g m⁻²) at 30 and 60 DAS over rest of herbicide treatments but it was found at par with clethodim 24% EC @ 48 g a.i. ha⁻¹ + NIS + AMS. These results are in close proximity with those of Singh *et al.*⁷, Jain *et al.*⁵.

Table 3: Effect of clethodim 24% EC herbicide on weed dry matter accumulation (g m⁻²)

Treatment	30 DAS			60 DAS		
	2010	2011	Pooled	2010	2011	Pooled
Clethodim 24% EC @ 36 g a.i. ha ⁻¹ + NIS + AMS	16.90	18.18	17.54	17.88	18.94	18.41
Clethodim 24% EC @ 48 g a.i. ha ⁻¹ + NIS + AMS	14.61	15.89	15.25	16.05	16.95	16.50
Clethodim 24% EC @ 60 g a.i. ha ⁻¹ + NIS + AMS	14.24	15.52	14.88	15.05	15.02	15.03
Clethodim 24% EC @ 48 g a.i. ha ⁻¹ + NIS	16.06	16.35	16.20	16.97	17.95	17.46
Clethodim 24% EC @ 48 g a.i. ha ⁻¹ + AMS	15.75	17.03	16.39	17.26	18.27	17.77
Clethodim 24% EC @ 48 g a.i. ha ⁻¹	15.52	16.80	16.16	16.97	17.95	17.46
Fenoxaprop-P-Ethyl 9.3% EC @ 50 g a.i. ha ⁻¹	15.80	17.08	16.44	16.19	17.10	16.64
Pendimethalin 30% EC @ 0.75 kg a. i. ha ⁻¹ PE	15.98	17.26	16.62	16.44	17.37	16.91
Two hand weeding	7.74	9.02	8.38	8.96	9.22	9.09
Weedy check control	29.26	30.54	29.90	40.32	43.37	41.84
SEm +	0.41	0.45	0.39	0.50	0.55	0.48
CD(P = 0.05)	1.22	1.34	1.19	1.51	1.64	1.50

Weed control efficiency: An examination of data (Table 4) shows that clethodim 24% EC @ 60 g ha⁻¹ + NIS + AMS (50.14 and 61.61 per cent) and clethodim 24% EC @ 48 g ha⁻¹ + NIS + AMS (49.01 and 60.54 per cent) were observed at par in respect of weed control efficiency at 30 and 60 DAS but both these

treatments gave higher weed control efficiency over rest of herbicides treatments in the pooled analysis. These results are in close proximity with those of Jain *et al.*⁵, Sharma⁶, Ayyadurai and Poonguzhalan¹, Verma *et al.*⁸, Singh *et al.*⁷, Chauhan and Yadav², Choudhary and Gaur³.

Table 4 : Effect of clethodim 24% EC herbicide on weed control efficiency (per cent)

Treatment	30 DAS			60 DAS		
	2010	2011	Pooled	2010	2011	Pooled
Clethodim 24% EC @ 36 g a.i. ha ⁻¹ + NIS + AMS	42.23	40.45	41.34	56.30	55.62	55.96
Clethodim 24% EC @ 48 g a.i. ha ⁻¹ + NIS + AMS	50.06	47.96	49.01	60.91	60.17	60.54
Clethodim 24% EC @ 60 g a.i. ha ⁻¹ + NIS + AMS	51.22	49.06	50.14	61.99	61.23	61.61
Clethodim 24% EC @ 48 g a.i. ha ⁻¹ + NIS	48.35	42.31	45.33	58.48	57.78	58.13
Clethodim 24% EC @ 48 g a.i. ha ⁻¹ + AMS	46.05	44.11	45.08	57.78	57.08	57.43
Clethodim 24% EC @ 48 g a.i. ha ⁻¹	46.87	43.25	45.06	58.57	57.85	58.21
Fenoxaprop-P-Ethyl 9.3% EC @ 50 g a.i. ha ⁻¹	45.82	43.88	44.85	58.44	58.00	58.22
Pendimethalin 30% EC @ 0.75 kg a. i. ha ⁻¹ PE	45.27	43.35	44.31	59.85	56.13	57.99
Weed free (two hand weeding)	73.52	70.42	71.97	78.72	77.76	78.24
Weedy check (control)	0.00	0.00	0.00	0.00	0.00	0.00
SEm +	1.21	1.31	1.16	0.94	0.94	0.86
CD(P = 0.05)	3.61	3.89	3.48	2.79	2.82	2.59

CONCLUSION

It could be concluded that, the post emergence herbicide clethodim 24% EC @ 60 gha⁻¹ + NIS + AMS at 15-20 DAS was effective in controlling grassy weeds in cotton resulting in to increased bolls plant⁻¹ and boll weight, seed cotton yield and also increased weed control efficiency at 30 and 60 DAS as compared to weedy check (control).

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