



EFFICACY OF PRE AND POST EMERGENCE HERBICIDES IN Bt COTTON (*GOSSYPIUM HIRSUTUM*) UNDER RAINFED CONDITION

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Abstract

A field experiment was conducted at Farm of Agronomy Department, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (Maharashtra), India; during *Kharif* season 2013-14. The results indicated that 1 Hoeing at 20 DAS *fb* Glyphosate 41SL @ 1.00 kg a.i./ha 45-55 DAS proves better in controlling weed, dry matter accumulation, weed control efficiency. Fenoxypop ethyl 10EC @ 0.1 kg a.i./ha PoE 20-25 + hoeing at 45 DAS recorded the maximum plant height (121.73 cm), number of functional leaves plant⁻¹ and leaf area per plant and maximum dry matter accumulation plant⁻¹ recorded in farmers practice (2H+1HW). Application of Pyriothobac sodium 10EC @ 0.062 kg a.i./ha PoE *fb* Quizalofop ethyl 10EC @ 0.075 kg a.i./ha PoE 20-25 DAS + hoeing at 45 DAS was superior over rest of the weed control treatments as regards all yield attributing traits and seed cotton yield + cotton stalk yield (kg/ha).

Key words : Cotton, herbicides, growth parameter, yield.

Introduction

Cotton (*Gossypium* spp. L.) is one of the important cash crop as well as fibre crop in India, which plays an important role in the nation economy, it is popularly known as white gold. India ranks first in area and seconds in production of the cotton. In Vidharbha, cotton is grown predominantly as a rained crop on about 14.90 lakh ha⁻¹ area with 27.40 lakh bales and 312.00 kg ha⁻¹.

The yield of the crop depends upon the environment in which it is grown and the management practices of the cropping system. Weed control under rainy period is biggest hurdle in crop production. The critical period of weed competition in cotton was found to be 15 to 60 days (Ayyadurai *et al.*, 2011). Losses caused by weeds in cotton ranges from 50 to 85 per cent depending upon the nature and intensity of weeds (Sharma, 2008). The traditional method of weed control is labour intensive, expensive, tedious and time taking. Under such circumstances, use of effective herbicides gives better and timely weed control. Hence the present investigation was undertaken.

Materials and Methods

The present investigation was carried out at Farm of Agronomy Department, Dr. Panjabrao Deshmukh Krishi

Vidyapeeth, Akola (Maharashtra), India; during *Kharif* season of 2013. The experiment was laid out in randomized block design with ten treatments replicated thrice.

Weedy check (T₁), Farmers practice- 2H + 1HW (T₂), Cotton + Green gram (*Vigna radiata*) (cover crop) (T₃), Pendimethalin 30EC PE @ 1.00 kg a.i./ha *fb* hoeing at 30 DAS (T₄), Quizalofop ethyl 10EC @ 0.075 kg a.i./ha PoE 20-25 DAS *fb* hoeing at 45 DAS (T₅), Pyriothobac sodium 10EC @ 0.062 kg a.i./ha PoE 20-40 DAS *fb* hoeing at 45 DAS (T₆), Propaquizofop 10EC @ 0.075 kg a.i./ha PoE 20-40 *fb* hoeing at 40 DAS (T₇), Fenoxypop ethyl 10EC @ 0.1 kg a.i./ha + hoeing at 45 DAS (T₈), 1 Hoeing at 20 DAS *fb* Glyphosate 41SL @ 1.00 kg a.i./ha 45-55 DAS (T₉), Pyriothobac sodium 10EC @ 0.062 kg a.i./ha PoE *fb* Quizalofop ethyl 10EC @ 0.075 kg a.i./ha PoE 20-25 DAS + hoeing at 45 DAS (T₁₀). The experimental site was fairly uniform in topography with clay in texture and slightly alkaline in reaction with pH of 7.8. It was low in available nitrogen, medium in available phosphorus and rich in potassium. Cotton seed variety Ajeet 155-Bt was sown on June 17, 2013 at a spacing 90 × 60 cm with RDF 60:30:30 NPK Kg ha⁻¹. The gross and net plot size were 7.2 m × 4.8 m and 4.5 m × 4.2 m, respectively.

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Table 1 : Effect of different weed control treatments on weed population, weed dry biomass, weed control efficiency and weed index in cotton.

Treatments	Weed count m ⁻² at harvest			Weed dry biomass harvest (g)	Weed control efficiency (%)	Weed index (%)
	Monocot	Dicot	Total			
T ₁ - Weedy check	62.33	52.44	114.77	151.71	—	38.60
T ₂ - Farmers practice (2H+1HW)	18.07	11.25	29.32	32.52	78.56	5.87
T ₃ - Cotton + green gram (<i>Vigna radiata</i>) (cover crop)	22.40	26.77	49.17	53.10	65.00	20.17
T ₄ - Pendimethalin 30EC PE @ 1.00 kg a.i./ha <i>fb</i> hoeing at 30 DAS	23.40	23.10	46.50	50.22	66.90	17.23
T ₅ - Quizalofop ethyl 10EC @ 0.075 kg a.i./ha PoE 20-25 DAS <i>fb</i> hoeing at 45 DAS	18.07	29.33	47.40	53.58	64.68	20.92
T ₆ - Pyriithiobac sodium 10EC @ 0.062 kg a.i./ha PoE 20-40 DAS <i>fb</i> hoeing at 45 DAS	25.07	19.10	44.17	49.47	67.39	10.99
T ₇ - Propaquizofop 10EC @ 0.075 kg a.i./ha PoE 20-40 <i>fb</i> hoeing at 40 DAS	22.73	27.54	50.27	56.56	62.72	20.39
T ₈ - Fenoxypop ethyl 10EC @ 0.1 kg a.i./ha PoE 20-25 + hoeing at 45 DAS	27.40	24.44	51.84	57.02	62.42	20.03
T ₉ - 1 Hoeing at 20 DAS <i>fb</i> Glyphosate 41SL @ 1.00 kg a.i./ha 45-55 DAS	15.07	13.10	28.17	30.42	79.95	5.07
T ₁₀ - Pyriithiobac sodium 10EC @ 0.062 kg a.i./ha PoE <i>fb</i> Quizalofop ethyl 10EC @ 0.075 kg a.i./ha PoE 20-25 DAS + hoeing at 45 DAS.	16.07	17.10	33.17	35.82	76.39	—
S.E(m)±	2.04	2.01	2.97	2.69	—	—
C.D. at 5%	6.06	5.97	8.83	7.99	—	—

DAS- Days after sowing, PE- Pre-emergence, PoE- Post-emergence.

Results and Discussion

Weed flora

Predominant weed species observed in the experimental field were *Xanthium strumarium*, *Parthenium hysterophorus*, *Euphorbia geniculata*, *Lagasca mollis*, *Euphorbia hirta*, *Tridax procumbense*, *Corchorus acutangulus*, *Abelmoscherus moschatus*, *Alternanathera sessilis*, *Digera arvensis* and *Celosia argentea* among the dicot weeds and *Cynodon dactylon*, *Cyperus rotundus*, *Commelina benghalensis*, *Dinebra arabica*, *Poa annua*, *Echinochloa crusgalli* and *Eragrostis major* among the monocot.

Weed parameters

The best control of monocot and dicot weeds and highest weed control efficacy was found in 1 Hoeing at 20 DAS *fb* Glyphosate 41SL @ 1.00 kg a.i./ha 45-55 DAS followed by farmers practice (2H+1HW), Pyriithiobac sodium 10EC @ 0.062 kg a.i./ha PoE *fb* Quizalofop ethyl 10EC @ 0.075 kg a.i./ha PoE 20-25

DAS + hoeing at 45 DAS (T₁₀). Whereas, lower weed dry biomass was observed with treatment 1 Hoeing at 20 DAS *fb* Glyphosate 41SL @ 1.00 kg a.i./ha 45-55 DAS (T₉) as compared to all other treatments, might be due to combination of cultural practice and herbicides that have longer effect on controlling weed population and brought significant reduction in weed dry matter as compared to weedy check. Similar results were reported by Srinivasalu *et al.* (2000). Weed control efficiency of all the treatments was higher, whereas weed index was noted lower as compared to weedy check. Similar findings were also reported by Kakade *et al.* (1999) and Manickam and Gnanamoorthy (1994). The highest weed control efficiency and lowest weed index was recorded under herbicidal treatment 1 Hoeing at 20 DAS *fb* Glyphosate 41SL @ 1.00 kg a.i./ha 45-55 DAS (T₉).

Growth parameters

Plant height, number of functional leaves plant⁻¹, Leaf area plant⁻¹ and dry matter accumulation were improved due to the different weed control treatments over control.

Table 2 : Growth characters, yield parameters, yield and economics as influenced by different weed control treatments.

Treatment	Growth characters				Yield parameters					Yield (Kg/ha)	
	Plant height (cm)	No. of functional leaves plant ⁻¹	Leaf area plant ⁻¹ (dm ²)	Dry matter accumulation plant ⁻¹ (g)	Number of boll picked plant ⁻¹	Weight of seed cotton plant ⁻¹	Boll weight (g)	Seed index (g)	Seed cotton Yield (kg ha ⁻¹)	Stalk yield (kg ha ⁻¹)	
T ₁ - Weedy check	86.39	25.43	27.54	105.17	10.67	53.84	2.89	8.03	787.04	1618.98	
T ₂ - Farmers practice (2H + 1HW)	111.44	39.67	37.46	175.33	27.33	76.21	3.58	9.65	1206.60	2377.00	
T ₃ - Cotton + green gram (<i>Vigna radiata</i>) (cover crop)	95.56	35.60	30.06	146.00	24.00	70.22	3.27	8.15	1023.34	2005.75	
T ₄ - Pendimethalin 30ECP @ 1.00 kg a.i./ha fb hoeing at 30 DAS	100.54	38.00	30.93	163.33	24.67	72.89	3.45	8.67	1060.96	2090.08	
T ₅ - Quizalofop ethyl 10EC @ 0.075 kg a.i./ha PoE 20-25 DAS fb hoeing at 45 DAS	98.66	34.30	31.44	149.17	23.67	63.96	3.27	8.33	1013.70	1966.57	
T ₆ - Pyriithiobac sodium 10EC @ 0.062 kg a.i./ha PoE 20-40 DAS fb hoeing at 45 DAS	110.03	38.77	31.16	155.17	26.00	74.48	3.61	8.86	1141.01	2270.61	
T ₇ - Propaquizofop 10EC @ 0.075 kg a.i./ha PoE 20-40 fb hoeing at 40 DAS	100.08	37.80	43.88	129.67	23.83	70.56	3.33	8.18	1020.45	1979.67	
T ₈ - Fenoxyprop ethyl 10EC @ 0.1 kg a.i./ha PoE 20-25 + hoeing at 45 DAS	121.73	40.07	54.00	168.50	24.33	68.65	3.42	8.40	1025.08	2039.90	
T ₉ - 1 Hoeing at 20 DAS fb Glyphosate 41 SL @ 1.00 kg a.i./ha 45-55 DAS	110.33	37.47	40.15	171.00	28.96	82.58	3.58	9.28	1216.82	2445.81	
T ₁₀ - Pyriithiobac sodium 10EC @ 0.062 kg a.i./ha PoE fb Quizalofop ethyl 10EC @ 0.075 kg a.i./ha PoE 20-25 DAS + hoeing at 45 DAS.	110.00	39.67	38.83	173.00	30.03	84.94	3.60	9.67	1281.83	2589.29	
S.E(m)±	3.76	2.33	2.29	10.02	1.47	4.75	0.16	0.23	76.16	150.02	
C.D. at 5%	11.16	6.92	6.81	29.77	4.36	14.13	NS	0.67	226.26	445.69	

Fenoxypop ethyl 10EC @ 0.1 kg a.i./ha PoE 20-25 + hoeing at 45 DAS recorded the maximum plant height (121.73 cm), number of functional leaves plant⁻¹ and leaf area per plant and maximum dry matter accumulation plant⁻¹ recorded in farmers practice (2H + 1HW) followed by Pyriothobac sodium 10EC @ 0.062 kg a.i./ha PoE *fb* Quizalofop ethyl 10EC @ 0.075 kg a.i./ha PoE 20-25 DAS + hoeing at 45 DAS, 1 Hoeing at 20 DAS *fb* Glyphosate 41SL @ 1.00 kg a.i./ha 45-55 DAS and lowest under weedy check was found effective in improving most of the growth parameters.

Yield parameters

Application of Pyriothobac sodium 10EC @ 0.062 kg a.i./ha PoE *fb* Quizalofop ethyl 10EC @ 0.075 kg a.i./ha PoE 20-25 DAS + hoeing at 45 DAS was superior over rest of the weed control treatments as regards all yield attributing traits namely weight of number of boll picked plant⁻¹, seed cotton plant⁻¹ and seed index revealing the beneficial effect of weed free environment resulting in no competition between weed and crop plant.

Yield

The results of the study indicated that maximum seed cotton yield + cotton stalk yield were obtained with application of Pyriothobac sodium 10EC @ 0.062 kg a.i./ha PoE *fb* Quizalofop ethyl 10EC @ 0.075 kg a.i./ha PoE 20-25 DAS + hoeing at 45 DAS as compared to other. This might be due to the better weed control associated with decrease in weed population and improvement in yield contributing characters in these treatments. Similar results were reported by Panwar *et al.* (2001) and Kakade (1996).

Economics

Treatment Pyriothobac sodium 10EC @ 0.062 kg a.i./ha PoE *fb* Quizalofop ethyl 10EC @ 0.075 kg a.i./ha PoE 20-25 DAS + hoeing at 45 DAS recorded significantly highest gross monetary returns Rs. 53862 ha⁻¹, whereas highest net monetary returns Rs. 16071.65 ha⁻¹ and benefit cost ratio 1.46 were recorded with 1 Hoeing at 20 DAS *fb* Glyphosate 41SL @ 1.00 kg a.i./ha 45-55 DAS. The lowest gross monetary returns, net monetary returns and benefit cost ratio were observed with weedy check. Similar results were reported by Bhol *et al.* (2007).

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