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Relative efficacy of integrated weed management in irrigated cotton (*Gossypium spp*.)

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ABSTRACT

The experiment was laid out in randomized block design (RBD) with three replications and ten treatments. Treatment consisted of pre-plant incorporation of trifluralin and fluchloralin at 1200 and 1120 g. a.i. ha^{-1}, respectively, post emergence sprays of glyphosate and haloxyfop (21 DAS) at1200 and 100 g a.i. ha^{-1}, respectively, along with or without hand weeding at 42 DAS, weed free and weedy check. The higher seed cotton and lint yield were obtained under weed free treatment (16.99 and 5.85 q ha^{-1}) closely followed by post emergence of glyphosate at 1200 g a.i. ha^{-1} with follow up hand weeding at 42 DAS (10.80 and 3.71 q ha^{-1}, respectively) and pre-plant incorporation of fluchloralin at 1120 g a.i. ha^{-1}, with a follow up hand weeding (10.66 and 3.65 q ha^{-1}, respectively). Weed competition throughout the crop growth period in irrigated cotton reduced the seed cotton and lint yield by 71.5 and 72.0 per cent, respectively. Ginning percentage and lint index of cotton were highest under weed free treatment followed by post emergence spray of glyphosate at 1200 g a.i. ha- after 21 days of sowing with a follow up hand weeding at 42 DAS steple length was not influenced significantly.

Key words : Relative efficacy, Interated weed management, Cotton.

INTRODUCTION

Cotton (*Gossypium spp*.) is a very important commercial crop in India, it sustains the country's cotton textile industry which is perhaps the largest segment of organized industries in the country.

Cotton is grown on 8.65 million ha area in India which constitutes 27 per cent of world area under cotton with production of 12.3 million bales (Singhal, 2003), whereas in Maharasthra, the area under cotton is 3.07 million ha with its production of 2.80 million bales. Yield levels in this crop keep fluctuating year after year depending upon the problem of insect pests and diseases that are closely associated with the climatic conditions in the region. Since its long growth cycle, the crop also panes through frequent rains and thus weeds also pose a serious problem. Losses caused by weeds in cotton range from 45-75 per cent depending upon nature and intensity of weeds (Brar and Gill, 1983 and Sandhu *et al.*, 1996). Weeds primarily complete for nutrients, moisture and sunlight in the early stage than in later stage. The critical period of weed competition in cotton was found to be 15-60 days (Mishra, 1997). To eliminate the weed competition, crop should be kept weed free at least first 4-6 weeks after sowing (Brar and Gill, 1983). According to Chander *et al.* (1994) herbicides alone or in combination with one hand weeding reduced the dry weight and nutrient uptake of weeds significantly. Some of the herbicides viz., trifluralin, pendimethalin, flumeteron, and diuron have been found very promising for this crop (Spark, 1997). The present investigation was an attempt in this direction to establish appropriate weed management practice in irrigated cotton.

MATERIALS AND METHODS

The field experiment entitled "Relative efficacy of integrated weed management in irrigated cotton" was carried out under irrigated condition during summer season of 2003. The soil of the experimental field was vertisol and clayey in texture. The chemical composition indicated that the soil was alkaline in reaction (pH 7-9), low in available nitrogen (144.72 kg ha^{-1}) medium in available phosphorus (18.03 kg ha^{-1}) and high in available potassium (438.68 kg ha^{-1}).

Treatment details :

Haloxyfop*:*

It is post emergent selective Trans located herbicide.

Fluchloralin *:*

It is an emulsifiable concentrate and it is selective herbicide applied as pre sowing.

Glyphosate *:*

It is an emulsifiable concentrate, non selective translocated herbicide local name round up^{R}. Glycel^{R}.

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Treatment details :

S. No.	Treatment	Dose (g a.i.ha^{-1})	Time of application (DAS)	Symbol used
1.	Haloxyfop	100	21	T_1
2.	Glyphosate	1200	21	T_2
3.	Trifluralin	1200	PPI	T_3
4.	Fluchloralin	1220	PPI	T_4
5.	Haloxyfopt	100	21	T_5
6.	Glyphosate +	1200	21	
	Hand weeding	-	42	T_6
7.	Trifluralin +	120-	PPI	
	Hand weeding	-	42	T_7
8.	Fluchloralin +	1120	PPI	
	Hand weeding	-	42	T_8
9.	Weed free	-	-	T_9
10.	Weedy check	-	-	T_{10}

a.i. = active ingredient DAS = Days after sowing PPI = Pre plant incorporation

Trifluralin :

Used as a selective herbicide for pre-plant control of annual weeds.

Weed control efficiency :

$$WCE = \frac{WPC - WPT}{WPC} \times 100$$

Where,

WCE = weed control efficiency.
WPC = weed population in weedy plot
WPT = weed population in treated plot.

Weed Index (WI) :

$$WI = \frac{X - Y}{X} \times 100$$

Where,

WI= weed index
X = yield from weed free plot
Y = yield from the treated plot.

$$\text{Ginning percentage} = \frac{\text{Lint weight}}{\text{Seed cotton weight}} \times 100$$

$$\text{Link index} = \frac{\text{Weight of 100 seeds x Ginning (\%)}}{100 - \text{Ginning \%}}$$

RESULTS AND DISCUSSION

Yield studies :

Seed cotton yield :

Highest seed cotton yield (16.99 q ha^{-1}) was obtained from weed free treatment which was comparable with glyphosate at 1200 g a.i. ha^{-1} Fb HW (10.80 q ha^{-1}) and fluchloralin at 1120 g a.i. ha^{-1} followed by hand weeding (10.66 q ha^{-1}). Both were at par with each other and proved significantly superior over all the chemicals and integrated methods of weed control including weedy check. Similar results were also reported by Nadanassababody and Kandasamy (2002a), Yadav *et al.* (2003) reported that significantly less seed cotton yield was obtained in weedy check (4.85 qha^{-1}). Alone haluxyfop or trifluralin applications yielded significantly less seed cotton produce showing their in effectiveness in weed control and both the treatments were at par with weedy check.

Stalk yield :

The mean stalk yield of cotton was 39.10 qha^{-1}. The stalk yield of weedy check (23.86 qha^{-1}) was significantly the lowest among all the treatments. Among chemical treatments, post emergence spray of haluxyfop (21 DAS) at 100 g a.i. ha^{-1} recorded lowest stalk yield and were at par with each other and that of weedy check. The stalk yield under weed free treatment (75.09 qha^{-1}) was significantly more than the rest of the treatments, post emergence application of glyphosate (21 DAS) at 1200 g a.i.ha^{-1}) fb hand weeding 42 DAS (47.82 qha^{-1}) which was next in order of significance and was at par with the yield obtained from pre-plant incorporation of fluchloralin at 1120 g. a.i. ha^{-1} fb hand weeding 42 DAS (47.38 qha^{-1}).

Biological yield :

The biological yield in weed free treatment was significantly more (92.07 qha^{-1}) than that recorded in rest

Table 1 : Seed cotton yield, stalk yield and total biological yield as influenced by different treatments.

S. No.	Treatment	Dose (g a.i. ha^{-1})	Time of application (DAS)	Seed cotton yield (q ha-1)	Stalk yield (q ha-1)	Total biological yield (q ha^{-1})	Lint yield (q ha^{-1})
1.	Haloxyfop	100	21	5.09	24.68	29.77	1.72
2.	Glyphosate	1200	21	6.55	31.08	37.63	2.23
3.	Trifluralin	1200	PPI	5.95	29.78	35.73	2.02
4.	Fluchloralin	1220	PPI	6.55	31.12	37.67	2.23
5.	Haloxyfopt	100	21	7.85	38.62	46.47	2.68
	Hand weeding	-	42				
6.	Glyphosate +	1200	21	10.80	47.82	58.62	3.71
	Hand weeding	-	42				
7.	Trifluralin +	1200	PPI	9.35	41.59	50.94	3.20
	Hand weeding	-	42				
8.	Fluchloralin +	1120	PPI	10.66	47.38	58.04	3.65
	Hand weeding	-	42				
9.	Weed free	-	-	16.99	75.09	92.07	5.85
10.	Weedy check	-	-	4.85	23.86	28.72	1.64
	'F' test			Sig.	Sig.	Sig.	Sig.
	S.E.m			0.45	2.10	2.56	016
	C.D. at 5%			1.34	6.23	7.61	0.46
	General mean			7.46	39.10	47.56	2.89

Fb : followed by, DAS= Days after sowing, PPI = Pre-plant incorporation

of the treatments. Post emergence spray of glyphosate (21 DAS) at 1200 q a.i. ha^{-1} with a follow up hand weeding 42 DAS (58.62 q ha^{-1}) was next in order of significance and was at par with that obtained from pre plant incorporation of fluchloralin at 1120 g a.i. ha^{-1} fb hand weeding 42 DAS (58.04 q ha^{-1}). Significantly lowest biological yield (28.71 q ha^{-1}) was recorded in weedy check because of more competition between crop and weeds for available soil moisture, nutrients etc. similar results were obtained by Nalayini, *et al.* (2001 b).

Lint yield :

The mean lint yield of cotton was 2.89 qha^{-1}.. Highest lint yield was obtained from weed free treatment (5.85 qha-1) which was significantly more than all the treatments. The next best treatment were glyphosate at 1200 g. a.i. ha^{-1} with a follow up hand weeding 42 DAS (3.71 q ha^{-1}) pre-plant incorporation of fluchloralin at 1120 g. a.i. ha^{-1} fb hand weeding 42 DAS (3.65 q ha^{-1}) and pre-plant incorporation of trifluralin at 1200 g a.i. ha^{-1} fb hand weeding 42 DAS (3.20 q ha^{-1}) which were at par with each other. This was due to control of most of the weed species. Unweeded control resulted in significantly less lint yield (1.64 q ha^{-1}) as compared to rest of the treatment except that of alone chemical treatments of haluxyfop and trifluralin which were at par with it showing their negative influence on yield performance.

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