

INTEGRATED WEED MANAGEMENT IN IRRIGATED HYBRID COTTON

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ABSTRACT

A field experiment was conducted during January-July, 2005 to study the effect of integrated weed control methods in irrigated cotton hybrid. Pre-emergence application of fluchloralin at 1.00 kg ha^{-1} followed by post-emergence directed application of glyphosate at 0.80 kg ha^{-1} at 45 DAS recorded the least weed count (19.39 m^2) and weed dry matter production ($124.70 \text{ kg ha}^{-1}$) favouring higher seed cotton yield (25.34 q ha^{-1}). Application of fluchloralin and pendimethalin at lower doses in combination with one hand weeding produced significantly higher seed cotton yields than application of these herbicides alone in higher doses.

Cotton (*Gossypium hirsutum* L.) is a very important commercial crop of India and plays a pivotal role in agricultural economy of the country. Cotton, being a long duration, wide spaced and relatively slow growing crop in early stages, is subjected to a severe weed menace. Weed infestation in cotton has been reported to offer severe competition and causing yield reduction to the extent of 74 per cent (Shelke and Bhosle, 1990). Inadequate weed control is considered as a major constraint for high yield. Manual weeding is not always practicable, being expensive and time consuming. Availability of labour for timely weeding may be inadequate owing to peak season of labour demand. Pre-emergence application of herbicides would be appropriate for minimizing only the early weed competition and problem of late emerging weeds is more serious. Further, the performance of soil applied herbicides has been found to be erratic due to lack of soil moisture and high temperature at sowing. So, pre-emergence herbicides need to be integrated with hand weeding or followed by post-emergence herbicides. Based on the above facts in view, the present investigation was carried out to evolve a suitable effective weed control methods for irrigated cotton hybrid.

A field experiment was conducted at Department of Agronomy, Annamalai University, Tamil Nadu, India, during January-July, 2005 to study the integrated weed control programs

in irrigated cotton hybrid. The experimental station is located at $11^{\circ} 24'$ latitude, $79^{\circ} 41'$ longitude at an altitude of 5.79 m above mean sea level. The soil of the experimental field was clayey loam with a pH of 7.7 and was low in available nitrogen (210 kg ha^{-1}), medium in available phosphorus (19.2 kg ha^{-1}) and high in available potassium (301 kg ha^{-1}). A set of nine treatments (Table 1) was laid out in randomized block design with three replications. The sowing of cotton seeds of hybrid RCH 2 was done on 20th January, 2005 at spacing of $120 \times 60 \text{ cm}$. The recommended doses of 120 kg N , $60 \text{ kg P}_2\text{O}_5$ and $60 \text{ kg K}_2\text{O ha}^{-1}$ were applied along with farm yard manure (FYM) at 12.5 t ha^{-1} . The whole quantity of P_2O_5 , K_2O and FYM and half dose of nitrogen were applied at the time of field preparation. Remaining half dose of nitrogen was applied at 60 days after sowing (DAS). The pre-emergence herbicide pendimethalin was sprayed on 3 days after sowing (DAS) by knap sack sprayer with flood jet nozzle using $600 \text{ l of water ha}^{-1}$ as per the treatments. Fluchloralin was sprayed on dry soil and was immediately followed by irrigation. Glyphosate was sprayed at 45 DAS as per treatments. The directed application of this herbicide was done using a protective hood to save the crop. All the intercultural operations were done as and when required. The data on weed count and weed dry matter production (DMP) were recorded at

Table1. Effect of treatments on individual weed species count in cotton on 90 DAS

Treatments	<i>Cyperus rotundus</i>	<i>Cynodon dactylon</i>	<i>Trianthema portulacastrum</i>	<i>Echinochloa colonum</i>	<i>Panicum repens</i>	<i>Eclipta alba</i>	<i>Cleome viscosa</i>	Others
Control	6.76 (45.20)	2.37 (5.10)	4.60 (20.60)	5.08 (25.33)	4.37 (18.61)	3.42 (11.10)	4.64 (21.06)	3.11 (9.20)
Hand weeding (HW) Twice at 30 & 60 DAS	3.15 (9.40)	-	2.04 (3.66)	1.68 (2.33)	1.58 (1.00)	1.47 (1.66)	1.23 (1.00)	1.87 (3.00)
Glyphosate @ 1.10 kg ha ⁻¹	2.21 (4.40)	-	3.03 (8.66)	2.42 (5.33)	2.20 (4.33)	2.04 (3.66)	1.58 (2.00)	2.98 (8.40)
Pendimethalin @ 1.50 kg ha ⁻¹	2.80 (7.33)	2.17 (4.20)	3.29 (10.33)	3.54 (12.00)	1.98 (8.40)	1.96 (3.33)	2.27 (4.66)	2.92 (8.00)
Pendimethalin @ 1.00 kg ha ⁻¹ + HW at 45 DAS	3.11 (9.20)	1.58 (2.00)	2.48 (5.66)	-	-	2.20 (4.33)	1.96 (3.33)	1.58 (2.00)
Pendimethalin @ 1.00 kg ha ⁻¹ + Glyphosate @ 0.80 kg ha ⁻¹	2.17 (4.20)	1.58 (2.00)	2.55 (6.00)	1.23 (2.14)	1.78 (2.66)	1.22 (1.00)	1.58 (2.00)	1.87 (3.00)
Fluchloralin @ 1.50 kg ha ⁻¹	2.93 (8.10)	1.78 (2.66)	3.58 (12.33)	2.92 (8.00)	2.35 (5.00)	2.12 (4.00)	2.17 (4.20)	2.92 (8.00)
Fluchloralin @ 1.00 kg ha ⁻¹ + HW at 45 DAS	2.42 (5.33)	1.61 (2.10)	2.81 (7.40)	1.58 (2.00)	1.58 (2.00)	-	-	2.35 (5.00)
Fluchloralin @ 1.00 kg ha ⁻¹ + Glyphosate @ 0.80 kg ha ⁻¹	2.04 (3.66)	-	2.39 (5.20)	1.96 (3.33)	1.87 (3.00)	1.30 (1.20)	-	1.87 (3.00)
SE _D	0.76	0.65	0.86	-	-	-	-	0.72
CD (p=0.05)	0.38	0.32	0.43	-	-	-	-	0.36

Figures in parentheses are original values before square root transformation

90 DAS and weed control index (WCI) of different treatments was computed using data on weed DMP. Final picking was completed on 12th July, 2005. The observation recorded on cotton were plant height, number of sympodial branches plant⁻¹, number of bolls plant⁻¹ and seed cotton yield ha⁻¹. The experimental data were statistically analyzed using the methods described by Panse and Sukhatme (1978). After subjecting the data to analysis of variance, least significant difference was worked out at 5 per cent probability level. The data on weed count were

transformed by square root transformation, before analysis.

Effect on weeds : The predominant weeds of the experimental plot were: *Cyperus rotundus*, *Cynodon dactylon*, *Trianthema portulacastrum*, *Echinochloa colonum*, *Eclipta alba*, *Panicum repens* and *Cleome viscosa*. All the weed control treatments caused significant reduction in total weed density and weed DMP when compared to unweeded control (Table 1). Directed application of glyphosate @ 0.80 kg ha⁻¹ reduced the weed count (19.39 m⁻²) and weed DMP

Table 2. Effect of integrated weed management in weed count, weed DMP, weed control index and growth and yield parameters of cotton

Treatments	Total weed count m ⁻² on 90 DAS*	Weed DMP on 90 DAS (kg ha ⁻¹)	Weed Control Index (%)	Plant height (cm)	Number of branches plant ⁻¹	Number of bolls plant ⁻¹	Seed cotton yield (q ha ⁻¹)
Control	12.52 (156.20)	1210.20	-	71.00	20.52	14.00	5.70
Hand weeding (HW) Twice at 30 & 60 DAS	4.75 (22.05)	139.42	88.48	137.13	41.00	96.95	24.88
Glyphosate @ 1.10 kg ha ⁻¹	6.11 (36.78)	235.50	80.54	134.27	32.00	71.00	19.00
Pendimethalin @ 1.50 kg ha ⁻¹	7.66 (58.25)	357.42	70.46	127.60	30.05	64.20	17.68
Pendimethalin @ 1.00 kg ha ⁻¹ + HW at 45 DAS	5.20 (26.52)	153.48	87.31	133.72	36.00	80.78	23.20
Pendimethalin @ 1.00 kg ha ⁻¹ + Glyphosate @ 0.80 kg ha ⁻¹	4.64 (21.00)	133.75	88.95	138.75	42.11	98.15	25.00
Fluchloralin @ 1.50 kg ha ⁻¹	7.27 (52.29)	341.00	71.82	129.20	32.74	67.00	18.00
Fluchloralin @ 1.00 kg ha ⁻¹ + HW at 45 DAS	4.93 (24.83)	142.50	88.23	135.00	38.02	83.33	23.66
Fluchloralin @ 1.00 kg ha ⁻¹ + Glyphosate @ 0.80 kg ha ⁻¹	4.46 (19.39)	124.70	89.70	141.00	43.84	99.18	25.34
SE _D	4.90	34.51	-	10.41	6.30	8.72	1.25
CD (p=0.05)	2.91	17.20	-	5.20	3.15	4.36	0.62

* Original figures in parentheses were subjected to square root transformation before analysis

(124.70 kg ha⁻¹) and increased the WCI (89.70%) where this herbicide was applied after the pre-emergence application of fluchloralin @ 1.00 kg ha⁻¹. This was at par with the pre-emergence application of pendimethalin @ 1.00 kg ha⁻¹ followed by directed application of glyphosate @ 0.80 kg ha⁻¹ and the treatment of hand weeding twice. This might be due to the effective control of all types of weed by the pre-emergence herbicide during the initial stages followed by control of all type of weeds by spraying the directed application of glyphosate due to its

systemic action and it made a cover of killed weeds on soil surface which did not allow new weeds to emerge and provided season long control of weeds. This finding is in line with the results of Panwar *et al.* (2001). Application of pre-emergence and post-emergence herbicides alone were found to be less effective in reducing weed counts and weed DMP.

Effect on crop : All the weed management treatments increased the plant height, number of sympodial branches plant⁻¹, number of bolls plant⁻¹ and seed cotton yield ha⁻¹ over unweeded

control (Table 2). The pre-emergence application of fluchloralin followed by post-emergence directed application of glyphosate was effective and significantly superior to the rest of treatments by recording highest plant height (141.00 cm), number of sympodial branches (43.84 plant^{-1}), number of bolls (99.18 plant^{-1}) and seed cotton yield (25.34 g ha^{-1}). This treatment was comparable to the pre-emergence application of pendimethalin followed by post-emergence

directed application of glyphosate and the treatment of hand weeding twice. This is due to suppression of weed competition by integrated weed control treatments offering efficient and prolonged weed control leading to higher seed cotton yield. Application of pendimethalin and fluchloralin at lower doses in combination with one hand weeding provided significantly higher seed cotton yields than application of these herbicides alone at higher doses.

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