

Integrated weed management in rainfed cotton (*Gossypium hirsutum* L.)

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ABSTRACT

A field experiment was conducted during the rainy season (*kharif*) 2000 to 2002 at Agriculture College farm, Nagpur, to find out suitable integrated method of weed control for rainfed cotton. Pre- and post-emergence application of herbicides along with 2 hand-weedings and 2 hoeings at 20 and 40 days after sowing (DAS) gave effective control of weeds. The highest weed-control efficiency was recorded by pre-emergence application of pendimethalin followed by post-emergence application of glyphosate with 2 hand-weedings and 2 hoeings at 20 and 40 days. Maximum seed-cotton yield (8.54 q/ha) was recorded with 3 hand-weedings and 3 hoeings followed by pre- and post-emergence application of pendimethalin and glyphosate with 2 hand-weedings and 2 hoeings (8.44 q/ha). Maximum benefit : cost ratio (1.34) was recorded with 3 hand-weedings and 3 hoeings treatment. Among integrated weed-management treatments, the post-emergence application of glyphosate with 2 hand-weedings and 2 hoeings recorded more benefit : cost ratio compared to other integrated weed-management treatments.

Key words : Cotton, Integrated weed management, Herbicides, Weed-control efficiency, Economics

In cotton, weeds besides nutrients compete for moisture and sunlight, and weeds emerging late in the season are less competitive than those in early season. Balyan *et al.* (1983) and Deshpande *et al.* (1987) reported need of weed-free maintenance of 60–70 days after emergence for better yield in cotton. Looking at the erratic behaviour of rains and scarcity of labour, the integrated weed management in cotton has great importance. Cultural methods along with use of herbicides may prove effective in controlling weeds as well as cultural practices for better moisture conservation.

MATERIALS AND METHODS

An experiment was conducted with rainfed cotton variety 'PKV Rajat' during the rainy (*kharif*) season of 2000 to 2002 at Agriculture College farm, Nagpur. The experiment was laid out in randomized block design with 3 replications. The treatments were: T₁, 1 hand-weeding + 1 hoeing at 30 days after sowing (DAS) (control); T₂, 2 hand-weedings + 2 hoeings at 20 and 40 DAS; T₃, pre-emergence application of pendimethalin @ 1.0 kg a.i./ha + 1 hand-weeding + 1 hoeing; T₄, pre-emergence application of pendimethalin @ 1.0 kg a.i./ha + 2 hand-weedings + 2 hoeings; T₅, 1 hand-weeding + 1 hoeing with post-emergence application of glyphosate @ 1.0 kg a.i./ha at 50 DAS; T₆, 2 hand-weedings + 2 hoeings with post-emer-

gence application of glyphosate @ 10.0 kg a.i./ha at 50 DAS; T₇, 1 pre- and post-emergence application pendimethalin and glyphosate, respectively, with 1 hand-weeding + 1 hoeing; T₈, pre- and post-emergence application of pendimethalin and glyphosate, respectively, with 2 hand-weedings + 2 hoeings; and T₉, 3 hand-weedings + 3 hoeings at 20, 40 and 60 DAS. The experimental soil was Vertisol, low in nitrogen (208.2 kg/ha), medium in phosphorus (28.6 kg/ha) and high in potash (482.0 kg/ha) content. The pH of the soil was 8.1. Cotton variety was sown at 60 cm × 30 cm spacing and recommended dose of fertilizer, i.e. 50 kg N/ha and 25 kg P₂O₅/ha, was applied. The observations on weed count weed dry matter were recorded in 0.5 m² area. The yield parameters and yield were recorded and economics was worked out.

RESULTS AND DISCUSSION

Weeds

The weed count was less under all weed-management treatments than in 1 hand-weeding + 1 hoeing treatment (T₁) at 90 days after sowing. The weed biomass was also significantly reduced under weed-management treatments except pendimethalin + 1 hand-weeding + 1 hoeing and 1 hand-weeding + 1 hoeing treatment. The maximum weed-control efficiency was recorded in treatment of 2 hand-weedings + 2 hoeings with pendimethalin and glyphosate

Table 1. Effect of weed-management treatments on weed count, weed control efficiency, yield and economics of cotton

Treatment	Weed count (at 90 DAS)*		Weed-control efficiency (at 90 DAS)		Dry weed weight q/ha (at 90 DAS)		Mean bolls/ plant	Seed-cotton yield (q/ha)	Net monetary returns (Rs/ha)	Benefit : cost ratio
	2001	2002	2001	2002	2001	2002				
T ₁	10.73	10.48			20.73	20.26	7.7	4.76	4,855	0.87
T ₂	9.03	8.99	19.0	14.2	15.67	13.60	8.9	6.66	7,713	1.14
T ₃	9.27	9.12	13.6	13.0	17.33	15.33	7.8	5.74	5,149	0.70
T ₄	9.26	9.02	16.9	17.1	16.50	13.80	9.3	7.46	7,753	0.91
T ₅	8.55	8.35	20.4	20.3	11.13	11.46	8.2	6.40	6,986	1.01
T ₆	8.29	8.36	22.6	20.5	10.13	10.86	9.5	7.45	8,245	1.04
T ₇	8.53	8.58	20.3	18.2	10.60	10.26	8.9	6.77	6,256	0.72
T ₈	7.99	7.95	25.5	24.0	10.00	9.60	11.3	8.44	8,633	0.89
T ₉	8.51	8.13	20.8	17.1	12.40	10.41	11.6	8.54	10,605	1.34
CD (P=0.05) NS		2.12			4.13	5.80	3.0	2.14		

DAS, Days after sowing; * $\sqrt{X+0.5}$

in both the years. Jain and Jain (1980) also reported maximum weed control with pre- and post-emergence application of herbicides. The treatment of 1 hand-weeding + 1 hoeing + glyphosate was next in order recording weed-control efficiency. Less dry weed biomass was recorded in treatment of 2 hand-weedings + 2 hoeings + pendimethalin + glyphosate, while 1 weeding + 1 hoeing recorded higher dry weed biomass at 90 days in both the years.

Cotton

All weed-management treatments recorded more seed-cotton yield than 1 hand-weeding + 1 hoeing treatment (Table 1). The highest seed-cotton yield was recorded by 3 hand-weedings + 3 hoeings, followed by 2 hand-weedings + 2 hoeings + pendimethalin + glyphosate in pooled mean, indicating 76.3 and 76.2% increased seed-cotton yield, respectively, over 1 hand-weeding + 1 hoeing treatment. Gomashe *et al.* (1989) also reported the similar results. The least increased seed-cotton yield (19.8%) with 1 hand-weeding + 1 hoeing + pendimethalin over 1 hand-weeding + 1 hoeing treatment (control). Similar trend was noticed in yield-contributing parameters as that of seed-cotton yield/ha.

Benefit : cost ratio

The benefit : cost ratio was higher with 3 hand-weedings + 3 hoeings (1.34), followed by 2 hand-weedings + 2 hoeings (1.14). Wankhede *et al.* (1993) reported more economic returns with 3 hand-weedings and 3 hoeings. Amongst all integrated weed-management treat-

ments, more benefit : cost ratio (1.04) was recorded by the treatment of 2 hand-weedings + 2 hoeings + 2 hoeings + post-emergence application of glyphosate @ 1 kg a.i./ha at 50 days after sowing.

The treatment of 3 hand-weedings + 3 hoeings and the treatment of 2 hand-weedings + 2 hoeings with pre- and post-emergence application of herbicides recorded similar seed-cotton yield. Though 3 hand-weedings + 3 hoeings recorded higher seed-cotton yield economically, post-emergence application of glyphosate along with 2 hand-weedings + 2 hoeings can be recommended on the basis of benefit : cost ratio (1.04) in exceptional cases, where labour availability and wet period are the constraints to carry out timely cultural operation.

REFERENCES

- Balyan, R.S., Bhan, V.M. and Malik, R.K. 1983. Effect of weed removal at different time on the yield of cotton. *Cotton Development* **13**(2) : 9-10.
- Deshpande, R.M., Thakare, V.S., Patil, M.B. and Gomashe, B.P. 1987. Effect of weed removal at different time on yield of rainfed American cotton. *Research Journal, Punjabrao Krishi Vidyapeeth, Akola* **11**(2) : 174-175.
- Gomashe, B.P. and Kharkar, R.T. 1989. Effect of cultural practices and herbicides on weed control and yield of cotton. *Research Journal, Punjabrao Krishi Vidyapeeth, Akola* **13** (1) : 11-14.
- Jain, S.C. and Jain, N.K. 1980. Studies on integrated weed control approach in cotton (*Gossypium hirsutum* L.) in Madhya Pradesh. *Indian Journal of Weed Science* **12** (1) : 28-34.
- Wankhede, S.T., Kharache, S.G., Deshpande, R.M. and Ghatol, D.M. 1999. Weed management in rainfed upland cotton (*Gossypium hirsutum*). *Indian Journal of Agronomy* **38** (1) : 102-104.