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Integrated Weed Management in *Bt* Cotton (*Gossypium hirsutum* L.)

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Abstract – **A field experiment was conducted during 2007-08 to 2009-10 at Main Cotton Research Station, Surat involving ten treatments viz., weedy check, cultural practices (HW at 20, 40 and 60 DAS and IC at 45 and 90 DAS) and different rates of herbicides (Pendimethalin and Fluchloralin as pre-emergence and Quizalofop ethyl as post emergence). The experiment was laid out in randomized block design with three replications. The maximum dry weight of weed was recorded at harvest in the weedy check. All the herbicides and cultural operation treatments decreased significantly weed density than weedy check. Low weed density as well as dry weed weight was recorded under Pendimethalin 1.0 kg/ha pre emergence + hand weeding at 30 and 60 DAS tratment, followed by Fluchloralin 0.75 and 1.0 kg/ha pre-emergence with HW at 30 & 60 DAS and 3 HW at 20, 40 and 60 DAS and 2 IC at 45 and 90 DAS. The weed control efficiency was observed highest under treatment of Pendimethalin 1.0 kg/ha + hand weeding at 30 and 60 DAS, followed by Fluchloralin 0.75 or 1.0 kg/ha + hand weeding at 30 and 60 DAS and local practices. The higher weed control efficiency with the above treatment would be attributed due to lower weed dry bio-mass. Growth and yield attributes were affected remarkably due to different treatments. All herbicidal treatments as well as HW at 20, 40 and 60 and IC at 45 and 90 DAS resulted in more number of sympodial branches, bolls per plant and boll weight over weedy check. The highest seed cotton yield was recorded in the treatment of Pendimethalin 1.0 kg/ha + HW at 30 and 60 DAS. In terms of economics, the maximum net monetary returns was accrued under treatment of Pendimethalin 1.0 kg/ha as pre-emergence +HW at 30 and 60 DAS. Thus integrated weed management practice is effective, efficient and economical to control weeds in Bt cotton.**

Keywords – **Seed Cotton Yield, Weed Control Efficiency, Weed Management.**

I. Introduction

Cotton is one of the most important commercial crops of India, it plays important role in the Indian economy. Being a long duration and widely spaced crop, the yield loss of seed cotton in India due to weed competition was ranges between 50 to 85 per cent (Venugopalan *et al.,* 2009). Weed management plays very crucial role because wide spacing, initial slow growth, continuous rainfall and heavy use of nutrients provide enough room for profuse growth of weeds. Weeds being naturally hardy and competitive; compete well with crop for moisture, nutrients, light and space results in poor yield of crop. Looking to the variety of weed flora, feasibility and conveniences, it is difficult to adopt any single method of weed management, thereby emphasizing integrated approach in this regard. Keeping this in view, this experiment was planned.

II. Materials and Methods

A field experiment was conducted at Main Cotton Research Station, Navsari Agricultural University, Surat under irrigated condition during 2007-08 to 2009-10. The soils of experimental site is deep black, low in organic carbon (0.36 %), medium in available P (32.7 kg/ha) and high in available K (536 kg/ha). The experiment consist of ten treatments of weed management *viz.,* weedy check (control), local practices (Hand weeding at 20, 40 and 60 DAS and interculturing at 45 and 90 DAS) and different rates of herbicides (Pendimethalin and Fluchloralin as pre-emergence and Quizalofop ethyl as post emergence). These treatments were evaluated under randomized block design with three replications. Cotton *Bt.* variety "RCH-2" was sown on last week of June at 120 x 45 cm and fertilized with 240:0:0 kg NPK/ha during all three years of experimentation. Nitrogen was applied through urea in four equal split (60 kg/ha) at an interval of 30 days. The crop was irrigated twice at 20 days interval after cessation of monsoon. Weed population was counted from 1 m^2 area at 30 and 60 DAS, while weed dry weight from same fixed area in each plot was recorded at 30 and 60 DAS and at harvest. The observations related to growth and yield were recorded and subjected to statistical analysis.

III. Results and Discussion

Weed count, dry weed weight and weed control efficiency

Weed flora of the experimental site indicated that presence of 39 % grassy weeds and 61 % broad leaved weeds. The dominate species of grass weeds were: *Cynodon dactylon, Cyperus rotundus, Echinochloa colonum, Digitaria biafaciculata* and *Digitaria ramose*, while that of broad leaved weeds were: *Euphorbia genicullata, Digera arvensis, Amaranthus viridis, Trianthema monogyna, Alternenthera echinata and Eclipta alba.* Among all the weed control treatments less

number of weeds as well as low dry weed weight was recorded under Pendimethalin 1.0 kg/ha pre emergence + Hw at 30 and 60 DAS treatment followed by Fluchloralin 0.75 and 1.0 kg/ha pre-emergence with HW 30 & 60 DAS and cultural method (Hw at 20, 40 and 60 DAS and IC at 45 and 90 DAS). The maximum dry weight of weed was recorded at harvest in the weedy check. All the herbicides and cultural operation treatments decreased significantly weed density than weedy check. The weed control efficiency was observed highest under treatment of Pendimethalin 1.0 kg/ha + HW at 30 and 60 DAS followed by Fluchloralin 0.75 or 1.0 kg/ha + HW at 30 and 60 DAS and cultural practices. The higher weed control efficiency with the above treatment would be attributed due to lower weed dry bio-mass.

Growth, yield and yield attributes

Most of the growth and yield attributes were affected remarkably due to different weed management treatments. All herbicidal treatments as well as cultural practices (HW at 20, 40 and 60 DAS and IC at 45 and 90 DAS) resulted in more number of sympodial branches, bolls per plant and boll weight over weedy check. The highest reduction in cotton yield was under Weedy check treatment. The highest seed cotton yield was recorded under the treatment of Pendimethalin 1.0 kg/ha pre emergence + HW at 30 and 60 DAS (2753 kg/ha). However, the lowest seed cotton yield (1780 kg/ha) was noted under weedy check treatment. The higher yield under the integrated weed management practices may be attributed to better weed control and reduce crop weed competition in early growth stage, ultimately increase the cotton yield.

In terms of economics, the maximum net monetary returns (Rs.51667/ha) was accrued under the treatment of Pendimethalin 1.0 kg/ha as pre-emergence + HW at 30 and 60 DAS followed by Fluchloralin 0.75 or 1.0 kg/ha + HW at 30 and 60 DAS and cultural practices treatments.

REFERENCES

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Table 1: Weed density, dry weed weight and weed control efficiency as affected by different weed management treatments in *Bt* cotton

Treatments	30 DAS		60 DAS		Dry weed weight (kg/ha)	Weed control efficiency (%)
	Weed count (no/m^2)	Dry weed weight (g/m^2)	Weed count (no/m^2)	Dry weed weight (g/m^2)		
Weedy	48.3	27.6	75.7	133.8	1478	--
Cutural practices (HW at 20,40 & 60 DAS + IC at 45 & 90 DAS)	27.3	16.9	20.5	45.0	449	69.62
Pendimethalin 0.75 kg/ha pre-em.+ HW at 30 & 60 DAS	23.8	16.7	21.8	46.6	470	68.20
Fluchloralin 0.75 kg/ha pre-em. + HW at 30 & 60 DAS	24.2	14.7	22.1	43.0	431	70.84
Pendimethalin 1.00 kg/ha pre-em. + HW at 30 & 60 DAS	20.5	14.1	21.0	40.2	401	72.87
Fluchloralin 1.00 kg/ha pre-em. + HW at 30 & 60 DAS	21.3	15.8	20.5	44.1	442	70.09
Pendimethalin 0.75 kg/ha pre-em.+ HW at 30 & 60 DAS	25.0	18.5	26.3	54.0	545	63.13
Fluchloralin 0.75 kg/ha pre-em. + Quizalofop-ethyl 0.04 kg/ha at 30 & 60 DAS	22.5	15.6	28.0	64.2	641	56.63
Pendimethalin 1.00 kg/ha pre-em. + Quizalofop-ethyl @ 0.05 kg a.i./ha at 30 & 60 DAS	20.8	13.2	25.7	65.3	656	55.62
Fluchloralin 1.00 kg/ha pre-em. + Quizalofop-ethyl 0.05 kg/ha at 30 & 60 DAS	17.8	14.5	23.0	52.3	525	64.48
S. Em. $\pm$	2.42	1.77	2.90	5.77	62.6	--
LSD (P=0.05)	7.77	5.67	9.27	18.46	186.1	--

Table 2: Growth, yield and economics of cotton as influenced by different treatments of weed management

Treatments	Plant height at harvest (cm)	No. of sympodial branches/ plant	No. of bolls/ plant	Boll weight (g)	Seed cotton yield (kg/ha)	Net return (Rs/ha)
Weedy	85.6	13.6	25.2	3.7	1780	29091
Cutural practices (HW at 20,40 & 60 DAS + IC at 45 & 90 DAS)	96.3	16.1	31.9	3.9	2353	41262
Pendimethalin 0.75 kg/ha pre-em.+ HW at 30 & 60 DAS	94.4	15.7	35.1	4.0	2575	47623
Fluchloralin 0.75 kg/ha pre-em. + HW at 30 & 60 DAS	92.4	15.6	32.0	3.9	2315	40738
Pendimethalin 1.00 kg/ha pre-em. + HW at 30 & 60 DAS	97.7	17.6	38.9	4.0	2753	51667
Fluchloralin 1.00 kg/ha pre-em. + HW at 30 & 60 DAS	96.4	16.1	35.8	3.8	2545	46184
Pendimethalin 0.75 kg/ha pre-em.+ HW at 30 & 60 DAS	93.5	14.7	31.0	3.9	2152	36768
Fluchloralin 0.75 kg/ha pre-em. + Quizalofop-ethyl 0.04 kg/ha at 30 & 60 DAS	90.3	15.1	30.1	3.9	2128	36212
Pendimethalin 1.00 kg/ha pre-em. + Quizalofop-ethyl @ 0.05 kg a.i./ha at 30 & 60 DAS	92.2	15.1	34.3	3.9	2504	45745
Fluchloralin 1.00 kg/ha pre-em. + Quizalofop-ethyl 0.05 kg/ha at 30 & 60 DAS	95.1	16.5	36.3	4.0	2629	48788
S. Em. ±	2.9	0.63	1.55	0.11	79.4	-
LSD (P=0.05)	NS	1.79	4.62	NS	224	-