Indian Journal of Weed Science **48**(3): 348–350, 2016
DOI: 10.5958/0974-8164.2016.00090.3

Short communication

Weed management in cotton with pre- and post-emergence herbicides

Kulvir Singh*, Harinder Pal Singh and Kuldeep Singh
Punjab Agricultural University, Regional Research Station, Faridkot, Punjab 151 203

Received: 23 July 2016; Revised: 13 August 2016

Keywords: American cotton, Bolls per plant, Seed cotton yield, Weed control efficiency

Weed control method effective in one set of conditions may not be effective in other set of conditions due to fertility variation and irrigation water availability (Nadeem *et al*. 2013). Herbicides have remained the principal tool and foundation of most effective weed control programs (Norsworthy *et al*. 2012). With increasing availability of new chemicals, their weed control efficiency needs to be evaluated. Generation of such information through field experimentation under site-specific conditions is very crucial for guiding cotton growers.

An experiment was conducted in 2014 at Punjab Agricultural University, Research Station, Faridkot, Punjab (30 ^{0} 40'N and 74 ^{0} 44 'E). The 10 weed control treatments (*i.e.* pendimethalin 1.0 kg/ha as pre-emergence + one hoeing, trifluralin 1.2 kg /ha PPI + one hoeing, quizalofop-ethyl 50 g/ha at 2-4 weed leaf stage + one hoeing, pendimethalin 1.0 kg/ha as pre-emergence + quizalofop-ethyl 50 g/ha at 2-4 weed leaf stage + one hoeing, pyrithiobac-sodium 62.5 g/ha at 2-4 weed leaf stage + one hoeing , pyrithiobac-sodium 62.5 g/ha + quizalofop-ethyl 50 g/ha at 2-4 weed leaf stage + one hoeing, glyphosate 1.0 kg/ha as directed spray at 45 DAS, weed free check, farmer's practice and weedy check/control) were evaluated in randomized block design having four replications. Hand hoeing in all the treatments was given at 60 DAS while, in farmer's practice, one hand hoeing at 60 DAS followed tractor hoeing at 90 DAS and application of glyphosate 0.5 kg/ha as directed spray to emerged weeds during rainy season. Weed population and biomass was recorded from quadrat measuring 50 x 50 cm and expressed per square meter. Data on growth, yield and other parameters were recorded from five randomly selected plants in each treatment plot while seed cotton yield (SCY) was recorded from whole plot.

Effect on yield attributes and seed cotton yield

Sympods per plant were highest in weed free check (30.0) though statistically at par with pendimethalin 1.0 kg/ha + quizalofop-ethyl 50 g/ha + one hoeing (28.3) and pyrithiobac-sodium 62.5 g/ha + quizalofop-ethyl 50 g/ha + one hoeing (27.1) while the statistically least value was recorded in weedy check (19.5). This might be due to the favorable conditions that existed during the early growth period owing to low weed population resulting in vigorous growth and development leading to higher number of sympods per plant. As a result of all these, significantly higher biomass was recorded in case of weed free plots (18.95 t/ha) as compared to all tested treatments except for pendimethalin 1.0 kg/ha + quizalofop-ethyl 50 g/ha + one hoeing (17.47 t/ha) with which it was at par. Statistically least biomass was recorded under weedy check (11.02 t/ha) which might be due to the maximum crop-weed competition.

Highest number of bolls per plant were observed in weed free check (54.5) though it was statistically at par with pyrithiobac-sodium 62.5g/ha + quizalofop-ethyl 50 g/ha + one hoeing (50.5) followed by pendimethalin 1.0 kg /ha + quizalofop-ethyl 50 g/ ha + one hoeing (49.0). Statistically least boll count was recorded in weedy check (33.0). Boll weight was highest under pendimethalin 1.0 kg/ha + one hoeing (4.07 g) while the minimum value was observed in weedy check (3.27).

Improved yield attributes such as bolls/plant and boll weight collectively resulted in highest seed cotton yield (3.55 t/ha) in weed free check, though it was statistically at par with pyrithiobac-sodium 62.5 g/ha + quizalofop-ethyl 50 g/ha + one hoeing (3.52 t/ha), pendimethalin 1.0 kg/ha + quizalofop-ethyl 50 g/ha + one hoeing (3.40 t/ha), however significantly least seed cotton yield (1.92 t/ha) was recorded in weedy check (Table 1). This might be due to the competition offered by weeds for various resources like light, water, nutrients *etc*. which retarded cotton growth. Panwar *et al.* (1995) also reported that weed control practices increased number of sympods, bolls per plant, boll weight and seed cotton yield. Weedy check recorded least yield because of severe weed

***Corresponding author:** kulvir@pau.edu

competition as revealed by highest weed population (70.0) and maximum weed dry matter (340.1 g). The increased crop-weed competition and poor availability of various growth factors to cotton crop plants have been clearly reflected in reduced yield contributing parameters such as boll number and boll weight. These results are in close conformity with the results of Patel *et al* (2014). Highest ginning out turn percentage (GOT%) was recorded under pendimethalin 1.0 kg /ha + one hoeing (33.8) while the least was found in weedy check (31.5) indicating deterioration of quality under weed infestation (Table 1).

Effect on weed dry matter, weed control efficiency and monetary parameters

Dry weight of weeds is an important measure showing the extent to which weeds have competed with the main crop and how weed growth has been affected by tested weed control practices. Non-significant differences for initial weed dry matter indicated uniformity of weed distribution among treatment plots. Results indicated wide variation among tested treatments for weed dry matter as well as weed control efficiency (Table 1). Among chemical treatments, pendimethalin 1.0 kg /ha + quizalofop-ethyl 50 g/ha + one hoeing resulted in least weed dry matter (98.6 g/m^2) followed by pyrithiobac-sodium 62.5 g/ha + quizalofop-ethyl 50 g/ha + one hoeing (133.2 g/m^2) while among all treatments under study, the least value was recorded in weed free check (32.8 g/m^2).This was due to the fact that frequent hoeing and inter-cultural operations allowed minimum weeds to grow and consequently weed free plots recorded least weed dry weight. Shahzad *et al.* (2012) and Nadeem *et al.* (2013) also reported that hand weeding and herbicidal treatments reduced the weed infestation efficiently. Weed control efficiency was highest under weed free check (90.3%) followed by pendimethalin 1.0 kg/ha + quizalofop-ethyl 50 g/ha + one hoeing (71.0%) and least under farmer's practice (25.5%). Our results were in accordance with Naseer-ud-Din *et al.* (2011).

Cost of cultivation was observed to be significantly higher (` 50802/ha) under weed free check. This was higher due to the fact that maximum number of manual/hoeing operation were performed to check the growth of weeds besides more cost incurred on picking seed cotton yield due to its relatively more quantity. Contrary to it, weedy check recorded least cost of cultivation (` 34502/ha). Highest net returns were observed under pyrithiobac-sodium 62.5 g/ha + quizalofop-ethyl 50 g/ha + one hoeing (` 100916/ha) followed by weed free plots (` 98393/ha) and pendimethalin 1.0 kg/ha + quizalofop-ethyl 50 g/ha + one hoeing (` 97018/ha) while the least returns were recovered from the crop under weedy conditions (` 46093/ha). B:C ratio was found to be highest for Trifluralin 1.2 kg/ha PPI + one hoeing (2.15) followed by pyrithiobac-sodium 62.5 g/ha + quizalofop-ethyl 50 g/ha + one hoeing (2.14) with statistically least value for weedy check (1.31).

Table 1. Seed cotton yield, yield attributes and other ancillary parameters as affected by different weed management treatments

Treatment	Initial weed dry matter (g/m^2) 50 DAS	Final weed dry matter (g/m^2)	WCE (%)	Seed cotton yield (t/ha)	Sympods /plant	Bolls/ plant	Boll weight (g)	GOT (%)	Net returns (x10^3 `/ha)	B:C ratio
Pendimethalin 1.0 kg/ha as PE + one hoeing	32.0 (34.2)	174.2 (13.2)	48.8	3.21	22.9	41.5	4.07	33.8	91.40	2.10
Trifluralin 1.2 kg/ha PPI + one hoeing	40.0 (39.1)	172.0 (13.0)	49.4	3.32	24.5	44.0	3.80	32.7	95.62	2.15
quizalofop-ethyl 50 g/ha at 30 DAS + one hoeing	30.6 (32.7)	167.9 (12.9)	50.6	3.06	25.3	44.7	3.67	33.2	85.98	2.00
Pendimethalin 1.0 kg/ha as PE + quizalofop-ethyl 50 g/ha + one hoeing	43.6 (41.3)	98.6 (9.9)	71.0	3.40	28.3	49.0	3.80	33.1	97.02	2.11
Pyrithiobac-sodium 62.5 g/ha at 20-30 DAS + one hoeing	42.6 (406)	216.5 (14.7)	36.3	3.21	25.8	43.1	3.75	33.5	90.88	2.07
Pyrithiobac-sodium 62.5g /ha + quizalofop-ethyl 50 g/ha at 2-4 weed leaf stage + one hoeing	41.3 (39.9)	133.2 (11.5)	60.8	3.52	27.1	50.5	3.55	33.5	100.92	2.14
Glyphosate 1.0 kg/ha as directed spray at 45 DAS	48.6 (44.1)	214.2 (14.6)	37.0	2.91	24.6	42.1	3.75	32.3	81.07	1.95
Weed free check	40.0 (39.1)	32.8 (5.8)	90.3	3.55	30.0	54.5	3.75	32.6	98.39	1.93
Weedy check	41.3 (39.9)	340.1 (18.4)	-	1.92	19.5	33.0	3.27	31.5	46.09	1.31
Farmers practice	40.6 (39.5)	253.5 (15.9)	25.5	3.04	22.7	38.8	3.90	31.7	85.46	2.02
LSD (P=0.05)	NS	1.4	-	0.47	3.1	8.3	0.36	1.36	17.10	0.28

Data on weed dry matter has been subjected to square root transformation; Figures in parenthesis are means of transformed values; GOT= Ginning out turn

Pyrithiobac-sodium 62.5 g/ha + quizalofop-ethyl 50 g/ha + one hoeing could provide effective control of weed in cotton

SUMMARY

Field experiment was conducted during *Kharif* 2014 to evaluate weed control efficiency of different herbicides for weed management and their effect on cotton crop. Highest seed cotton yield (3.55 t/ha) was recorded in weed free plots followed by pyrithiobac-sodium 62.5 g/ha + quizalofop-ethyl 50 g/ha + one hoeing (3.52 t/ha) owing to improved number of bolls per plant and boll weight. Statistically least yield was recorded under weedy check (1.92 t/ha). Weed control efficiency (WCE) was highest under weed free check (90.3%) followed by pendimethalin 1.0 kg/ha + quizalofop-ethyl 50 g/ha + one hoeing (71.0%), whereas minimum for weedy check (25.5%). Net returns (` 100916/ha) and B:C ratio (2.14) were highest for pyrithiobac-sodium 62.5 g/ha + quizalofop-ethyl 50 g/ha + one hoeing. Therefore, this set of chemicals combination along with cultural practices could be the practical solution for economically efficient and effective weed management in cotton.

REFERENCES

Nadeem MA, Muhammad I, Muhammad A, Asif T and Mubeen K. 2013. Effect of different weed control practices and sowing methods on weeds and yield of cotton. *Pakistan Journal of Botany* **45**: 1321-1328.

Naseer-ud-Din GM, Shehzad MA and Nasrullah HM. 2011. Efficacy of various pre and post-emergence herbicides to control weeds in wheat. *Pakistan Journal of Agricultural Sciences* **48**: 185-190.

Norsworthy JK, Ward SM, Shaw DR, Llewellyn RS, Nichols RL, Webster TM, Bradley KW, Frisvold G, Powles SB, Burgos NR, Witt WW, and Barrett M. 2012. Reducing the risks of herbicide resistance: best management practices and recommendations. *Weed Science* **60:** 31-62.

Panwar RS, Rathi SS, Malik RK and Malik RS. 1995. Effect of application time and hoeing on efficacy of pendimethalin in cotton. *Indian Journal of Agronomy* **40**: 153-155.

Patel BD, Patel RB, Sheta BT, Patel VJ, Patel RA, and Parmar DJ. 2014. Influence of integrated weed management practices on weeds and yield of Bt cotton. *Research on Crops* **15:** 503-507.

Shahzad MA, Nadeem MA, Sarwar MA, Naseer-ud-Din G M and F. Ilahi. 2012. Comparative efficacy of different post-emergence herbicides in wheat (*Triticum aestivum* L.). *Pakistan Journal of Agricultural Sciences* **49:** 27-34.