

Volume 15, Number 2-3, 2009

ISSN 1815-1094

Pakistan Journal  
of  
**WEED SCIENCE RESEARCH**  
A quarterly research journal of weeds and medicinal herbs



**Weed Science Society of Pakistan**  
**Department of Weed Science**  
**NWFP Agricultural University, Peshawar-25130, Pakistan**  
Ph.92-91-9216542/9218206/9216550; Fax: 92-91-9216520  
website:[www.wssp.org.pk/](http://www.wssp.org.pk/)

## EFFECT OF MECHANICAL AND CHEMICAL WEED CONTROL ON THE PRODUCTIVITY OF COTTON

Dilbaugh Muhammad<sup>1</sup>, Muhammad Naveed Afzal<sup>2</sup>, Ilyas Raza<sup>2</sup> and Muhammad Azam Mian<sup>2</sup>

### ABSTRACT

*Weed management practices are of prime importance in field crops. Field experiments were conducted in two consecutive years (2007-08) to evaluate the effect of different weed control measures on yield and yield components of cotton. The treatments were Stomp 330E @ 2.5 L ha<sup>-1</sup> (Pendimethalin 0.825 kg a.i. ha<sup>-1</sup>), Dual Gold 960E @ 2.0 L ha<sup>-1</sup> (S-metolachlor 1.92 kg a.i. ha<sup>-1</sup>), Round Up 490G/L @ 4.7 L ha<sup>-1</sup> (Glyphosate 2.303 kg a.i. ha<sup>-1</sup>), Mechanical weeding, Stomp 330E + Mechanical weeding, Dual Gold 960E + Mechanical weeding, Round Up 490G/L + Mechanical weeding and Untreated check. All chemical and cultural methods were arranged in a randomized complete block design with four replications. Cotton cultivar CIM-496 on silt loam soil. Results indicated that mechanical and chemical weeding increased seed cotton yield and yield components over untreated check. While, combination of mechanical and chemical weeding gave highly significant increase in seed cotton yield against untreated check. The interactive effect of Dual Gold 960E + Mechanical weeding resulted in 86.3 and 90.4% broad and narrow leave weeds control over untreated, respectively followed by Stomp + Mechanical weeding which gave 82.5 and 90.5% broad and narrow leave weeds control over untreated, respectively at 30 days after sowing whereas post emergence weedicide i-e Round Up 490G/L combined with Mechanical weeding gave maximum weed control of 96.0 and 89.5 % broad and narrow leave weeds control over untreated respectively at 60 days after sowing.*

**Key words:** Herbicides, *Gossypium hirsutum*, bed-furrow, weed management.

### INTRODUCTION

Cotton (*Gossypium hirsutum* L.) is one of the most important fiber crops and plays a pivotal role in agriculture, industrial

---

1 Senior Scientific Officer/Head Agronomy Department, Central Cotton Research Institute, Multan, Pakistan

2 Scientific Officer Agronomy, Central Cotton Research Institute, Multan, Pakistan

development, employment generation and economic development of Pakistan. Cotton crop contributes 8.6% value addition in agriculture and is a source of employment (40% of the rural community). It also fetches a substantial amount of foreign exchange (60%) through exportable surplus of cotton fiber and fiber made products and about 10% of GDP (Anonymous, 2007). There is however no doubt that harsh climate, higher average day temperature and lower average night temperature is the major constraint in reducing the boll weight, which ultimately leads to lower yield. Also, weed infestation is considered to be one of the major problems among biotic stresses. Mechanical method of weed control is not feasible due to its higher cost. Hence integration of different weed control strategies including the use of herbicides in combination with mechanical weed control practices is necessary for profitable production. The main advantage of integrated weed management is that the herbicides keep the crop weed free in early stages of growth and during later stages whereas the hand weeding and inter-culturing keep the weed population below economic threshold level.

Crop-weed competition for the first few weeks (4-7) after planting has the greatest effect on cotton yield (Douti, 1997). Oad *et al.* (2007) obtained maximum productive bolls per plant (32.3) and seed cotton yield (3942.50 kg ha<sup>-1</sup>) in hand weeded plots while Dual gold 960EC @ 2.5 litres ha<sup>-1</sup> as pre-emergence produced maximum weed control (56.66%), 23.20 productive bolls plant<sup>-1</sup> and 2992.50 kg ha<sup>-1</sup> seed cotton.

Deshpande *et al.* (2006) reported highest weed control in pre-emergence application of pendimethalin followed by post emergence application of glyphosate with 2 hand weedings and two hoeing at 20 and 40 days. Clewis *et al.* (2008) concluded that cotton lint yield increased with application of S-metolachlor and glyphosate-TM AEPOST compared with systems without S-metolachlor EPOST.

## **MATERIALS AND METHODS**

Field experiments were conducted at the Agronomic Research Area of Central Cotton Research Institute, Multan during 2007 and 2008. Cotton cultivar "CIM-496" was planted on May 27 during 2007 and June 3<sup>rd</sup> during 2008 on silt loam soil. The experiments were laid out in Randomized Complete Block (RCB) design with four replications on well prepared soil and bed-furrows were made 75 cm apart by tractor driven implement. Bed shaper was used to properly shape the beds for dibbling

cotton seed at proper place. Cotton seeds were planted manually by dibbling method @ 22.5 cm plant to plant within the rows. The planting irrigation was applied after sowing. Thinning was done 20 days after sowing by making single plant per hill. Stomp 330 E @ 2.5 L ha<sup>-1</sup> (Pendimethalin 0.825 kg a.i. ha<sup>-1</sup>) and Dual gold 960 EC @ 4.7 L ha<sup>-1</sup> (S-metolachlor 1.92 kg a.i. ha<sup>-1</sup>) were sprayed soon after planting on moist soil with knapsack hand sprayer. The post emergence herbicide Round up 490G/L @ 4.7 L ha<sup>-1</sup> (Glyphosate 2.303 kg a.i. ha<sup>-1</sup>) was sprayed 35 days after sowing in specific treatments as protective spray by using shield with spray nozzle. Interculturing was done at 28, 40 and 55 days after sowing during 2007 and 22, 35 and 45 days after planting during 2008. (Treatments are not clear: write clearly). The data were statistically analyzed by using the Fisher's analysis of variance techniques and least significant difference test at 5% probability level applied to compare the significance of the treatment means (Steel and Torrie, 1984).

## RESULTS AND DISCUSSION

All the mechanical and chemical weed control methods alone and in combination significantly increased the seed cotton yield and yield related traits in cotton (Table 1). Application of Stomp 330E, Dual Gold 960EC as pre-emergence and Round up 490 g/L as post-emergence alone produced 85.3, 94.6 and 79.0 % more seed cotton yield over check, respectively. Whereas, pre and post-emergence herbicides (Stomp 330E, Dual gold 960 EC and Round Up 490 g/L) in combination with mechanical weeding gave 126.2, 125.3 and 106.9% increase in seed cotton yield over untreated, respectively. Mechanical weeding alone gave 75.3% increase in seed cotton yield over the untreated check. Panwar *et al.* (2000), Ali *et al.* (2005), Sheikh *et al.* (2006) and Patil *et al.* (2007) reported similar results.

Data presented in Table-2 showed that all mechanical and chemical weed control methods alone and in combination gave significant weed control over weedy check. Dry weight of weeds after 30 after sowing with Stomp 330E as pre-emergence alone resulted in 78.5 and 81.3% broad and narrow leaf weeds control over weedy check, respectively. Dual gold 960EC (pre emergence) resulted in 81.0 and 84.5% broad and narrow leaf weeds control over weedy check. Mechanical weeding resulted in 40.1% broad and 49.3% narrow leaf weeds control over untreated. Interactive effect of Stomp 330E plus mechanical weeding resulted in 82.5% broad and 90.5% narrow leaf weeds control. Dual Gold 960EC plus mechanical weeding gave 86.3 and 90.4% broad and narrow leaf weeds control, respectively.

**Table-1. Seed cotton yield and its components as influenced by different cultural and chemical methods on bed-furrow planting.**

Treatment	Number of bolls plant <sup>-1</sup>	Boll weight (g)	Seed cotton yield (kg ha <sup>-1</sup> )	Increase over untreated (%)
Stomp 330E @ 2.5 L ha <sup>-1</sup>	21	2.51	1890	85.3
Dual Gold 960EC @ 2.0 L ha <sup>-1</sup>	22	2.54	1985	94.6
Round up 490G/L @4.7 L ha <sup>-1</sup>	19	2.52	1826	79.0
Mechanical weeding	20	2.58	1788	75.3
Stomp + Mechanical weeding	24	2.66	2307	126.2
Dual Gold + Mechanical weeding	23	2.64	2298	125.3
Round up + Mechanical weeding	22	2.63	2110	106.9
Untreated	13	2.40	1020	-
<b>LSD<sub>0.05</sub></b>	<b>2.809</b>	<b>ns</b>	<b>138.792</b>	<b>-</b>

**Table-2. Weeds intensity as influenced by different cultural and chemical methods after 30 days after planting on bed-furrow**

Treatments	Dry weight of weeds at 30 DAS* (g m <sup>-2</sup> )			
	Dry weight (g m <sup>-2</sup> )		% weed control	
	Broad leaved	Narrow leaved	Broad leaved	Narrow leaved
Stomp 330E @ 2.5 L ha <sup>-1</sup>	29.5	15.4	78.5	81.3
Dual Gold 960E @ 2.0 L ha <sup>-1</sup>	26.0	12.8	81.0	84.5
Round up 490G/L @4.7 L ha <sup>-1</sup>	125.3	80.0	8.5	2.9
Mechanical weeding	82.0	41.8	40.1	49.3
Stomp 330E + Mechanical weeding	23.9	7.8	82.5	61.5
Dual Gold 960E + Mechanical weeding	18.7	7.9	86.3	90.4
Round up 490G/L + Mechanical weeding	78.7	35.3	42.5	57.2
Untreated check	136.9	82.4	-	-
<b>LSD<sub>0.05</sub></b>	<b>2.107</b>	<b>2.852</b>		

**DAS\* = Days after sowing**

Dry weight of weeds ( $\text{g m}^{-2}$ ) given in Table-3 indicated that the weed intensity 60 days after sowing indicated that Stomp 330E gave 51.7% broad leaf weeds and 62.4% narrow leaf weeds control. While Dual Gold 960EC resulted in 55.3% broad leaf weeds and 68.5% narrow leaf weeds control over check. Round Up 490G/L alone resulted in 85.4% broad leaf weeds and 82.0% narrow leaf weeds control. However, Round up 490G/L in combination with mechanical weeding gave 96.0% broad leaf weeds and 89.5% narrow leaf weeds control than untreated control. The results are in line with the findings of Kumar *et al.* (2006) and Nikam *et al.* (2007) who reported that the decrease in weed density is a result of herbicidal application.

It is concluded that weed control methods, either mechanical or chemical alone does not give satisfactory weed control because of different weed flora in different areas and even in different fields. So, combination of mechanical and chemical weed control methods is recommended for profitable cotton production.

**Table-3. Weeds intensity as influenced by different cultural and chemical methods after 60 days after planting on bed-furrow**

Treatments	Dry weight of weeds at 60 DAS* ( $\text{g m}^{-2}$ )			
	Dry weight ( $\text{g m}^{-2}$ )		% weed control	
	Broad leaved	Narrow leaved	Broad leaved	Narrow leaved
Stomp 330E @ 2.5 L ha <sup>-1</sup>	94.9	51.1	51.7	62.4
Dual Gold 960E @ 2.0 L ha <sup>-1</sup>	87.8	42.9	55.3	68.5
Round up 490G/L @4.7 L ha <sup>-1</sup>	28.6	24.4	85.4	82.0
Mechanical weeding	99.6	78.0	49.3	42.6
Stomp 330E + Mechanical weeding	70.0	25.6	64.3	81.1
Dual Gold 960E +Mechanical weeding	63.8	19.5	67.5	85.7
Round up 490G/L + Mechanical weeding	08.0	14.2	96.0	89.5
Untreated check	196.4	135.8	-	-
<b>LSD<sub>0.05</sub></b>	<b>2.691</b>	<b>2.742</b>		

DAS\* = Days after sowing

## REFERENCES CITED

- Ali, M. A., S. Sabir, K.Yar, M. Ali and M. Saeed. 2005. Cultural and chemical weed management in cotton for higher profitability in Pakistan. *J. Agric. Res.* 43 (1):51-59.
- Anonymous. 2007. Economic survey of Pakistan. Ministry of Food, Agriculture and Livestock, Government of Pakistan, Finance Division. pp.20.
- Clewis, S. B., D. K. Millere, C. H. Koger, T. A. Baughman, A. J. Price, D. Porterfield and J. W. Wilcut. 2008. Weed management and crop response with glyphosate, s-metolachlor, trifloxysulfuron, prometryn and Msma in glyphosate-resistant cotton. *Weed Tech.* 22 (1):160-167.
- Deshpande, R. M., W. S. Pawar, P. S. Mankar, P. N. Bobde and A.N. Chimote. 2006. Integrated weed management in rainfed cotton (*Gossypium hirsutum* L.). *Ind. J. Agron.* 51(1):68-69.
- Douti, P. Y. 1997. Cotton crop versus weeds: when is the competition period. *Agriculture Development.* (special issue):11-16.
- Kumar, G. P., C. Chinnusamy, R. Shanmugasundaram and O.S. Kandasamy. 2006. Effect of early post-emergence herbicide for control of weeds in winter irrigated upland cotton (*Gossypium hirsutum* L.). *Ind. J. Agron.* 51(4):323-326.
- Nikram, S.V., C.B. Gaikwad, T.K. Tiwari and M.B. Dhonde. 2007. Relative efficacy of integrated weed management in irrigated cotton. *J. Maharashtra Agric. Univ.* 32 (2):308-309.
- Oad, F.C., M.H. Siddique, U.A. Buriro and G.S. Solangi. 2007. Weed management practices in cotton crop. *Asian J. Plant Sci.* 6(2):344-348.
- Panwar, R.S., R. S. Balyan and R.S. Malik. 2000. Evaluation of glufosinate for control of weeds in cotton. *Ind. J. Weed Sci.* 32(1/2):94-95.
- Patil, H.M., B.T. Shete and S.S.IIhe. 2007. Relative efficacy of integrated weed management in irrigated cotton (*Gossypium* spp.). *Intl. J. Agric. Sci.* 3(2):189-191.
- Sheikh, M.A., A.Saleem and N.A. Malik. 2006. Integrated weed management and its effect on seed cotton yield in cotton (*Gossypium hirsutum* L.) crop. *Pak. J. Weed Sci. Res.* 12(1/2):111-117.
- Steel, R. G. D. and J. H. Torrie, 1984. Principles and procedure of statistics. A biometric approach, 2<sup>nd</sup> edition, McGraw Hill Book Co. Inc. Tokyo.