Pak. J. Bot., 33(4): 383-387, 2001.

EFFECT OF SOWING METHODS AND HERBICIDES ON WEEDS AND YEILD OF COTTON (*GOSSYPIUM HIRSUTUM* L.)

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Abstract

Effect of two sowing methods i.e., ridge and flat sowing and different herbicides viz., pendimethalin (Stomp 330E) @ 1.03 kg a.i.ha^{-1}, pendimethalin (Stomp 445SC) @ 0.89 & 1.11 kg a.i.ha^{-1} and s-metolachlor (Dual gold 960EC) @ 1.92 & 2.40 kg a.i.ha^{-1} on weeds and yield of seed cotton was studied under field conditions. All the herbicides significantly reduced the dry weight of weeds as compared to weedy check. Maximum reduction (76%) was observed in s-metolachlor @ 2.40 kg a.i.ha^{-1}. All the herbicides resulted in significantly maximum number of sympodial branches per plant than weedy check. Maximum number of mature bolls and seed cotton weight was recorded in s-metolachlor @ 1.92 kg a.i.ha^{-1}. Weedy check gave significantly minimum seed cotton yield of 547.39 kg ha^{-1} compared with 1450.74 kg ha^{-1} in s-metolachlor 1.92 kg a.i.ha^{-1}.

Introduction

Cotton (*Gossypium hirsutum* L.) is an important cash crop of Pakistan. At present the average yield of seed cotton in Pakistan is 511.26 Kg ha^{-1} (Anon., 1999) which is low as compared with potential of our existing cultivars. The low per hectare yield beside many other factors may be attributed to serious weed infestation in cotton.

Crop weed competition for first few weeks is critical and decreases crop yield considerably. Average reduction in yield due to weed infestation is 33.26% (Zeman, 1983). Control of weeds is therefore essential for obtaining higher yield and better quality of the produce. Weed control by manual labour and mechanical means is laborious, time taking and very expensive. This necessitates the use of some other methods to effectively control the weeds. The introduction of chemical weed control technology has been proved relatively efficient and economical in controlling the weeds (Majid & Hussain, 1990).

Application of <5.92 l cyperal gave poor control of *Cyprus rotundus* assessed 45 day after application although control after 30 days was still acceptable. Application of metolachlor gave @ 3.70 lha^{-1} better control of grasses than benfuresate and after 45 days its control of *Cyprus rotundus* was similar to that provided by the highest rate of benfuresate. There was no evidence of photoxicity in cotton plants (Oviedo Zamora & Velasquez, 1987). Cotton yield was the maximum in the weed free control (mean 2385 kg ha^{-1}) followed by 1.5 kg ha^{-1} pendimethalin (pre-em) + hoeing twice 30 and 60 days after sowing (Panwar *et al.*, 1995). Growth behavior of weeds may also be different under different planting methods. In flat sowing weeds are present everywhere in soil whereas ridge sowing results in accumulation of upper soil along with weed seeds at a specific place so herbicide application varies in both the methods.

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Table 1. Effect of sowing methods and herbicides on dry weight of weeds, yield components and yield of cotton.

Treatments	Dry wt. of weeds (g)	No. of sympodial branches plant^{-1}	No. of mature bolls plant^{-1}	Seed cotton wt. boll^{-1}	Seed cotton yield (kg ha^{-1})
Sowing methods					
Flat sowing	64.85 NS	20.64 NS	22.42 NS	3.19 NS	1222.76 NS
Ridge sowing	48.72 NS	17.30 NS	20.83NS	3.11 NS	1042.68 NS
Herbicidal Treatments					
Control (weedy check)	93.19 a	15.97 b	13.43 c	2.72 c	547.39 c
Pendimethalin 33E @ 1.03 kg a.i.ha^{-1}	59.52 b	18.80 a	21.30 b	3.05 bc	1013.98 b
s-metolachlor 96EC @ 1.92 kg a.i.ha^{-1}	34.47 c	20.63 a	28.35 a	3.68 a	1450.74 a
s-metolachlor 96EC @ 2.40 kg a.i.ha^{-1}	22.12 c	20.30 a	23.83 b	3.26 ab	1264.62 ab
pendimethalin 44SC @ 0.89 kg a.i. ha^{-1}	63.36 b	19.63 a	22.02 b	3.40 ab	1212.76 ab
pendimethalin 44SC @ 1.11 kg a.i.ha^{-1}	64.68 bs	18.51 a	21.32 b	3.07 bc	1122.68 ab

Any two means carrying the same letter (s) are not significantly different at P=0.05

The present study was therefore designed to investigate the effect of pre-plant incorporation and pre-emergence application of herbicides under ridge and flat sowing on weed growth and yield of seed cotton.

Materials and Methods

The experiment was laid out in randomized complete block design with split plot arrangement having three replications keeping the sowing methods in main plot and herbicides in sub-plot. The net plot size was 3m x 4m. The herbicides used were pendimethalin (Stomp 330E) @ 1.03 kg a.i.ha^{-1}.pendimethalin (Stomp 445SC) @ 0.89 & 1.11 kg a.i.ha^{-1} and s-metolachlor (Dual gold 960EC) @ 1.92 & 2.40 kg a.i.ha^{-1}.

A recommended cotton variety "CIM-443" was sown with a single row hand drill on flat seedbed and manually on ridges having row to row distance of 75 cm. In flat sowing pendimethalin and s-metolachlor were sprayed just after sowing of cotton and incorporated into soil with a spade. In ridge sowing these herbicides were applied as pre-emergence 24 hours after irrigation. In both sowing methods plant to plant distance of 30 cm was maintained by thinning. Fertilizer was applied @ 175kg N and 57 kg P_2O_5 per hectare in the form of Urea and DAP. All the P_2O_5 and half of nitrogen was applied at the time of sowing while the remaining nitrogen was applied at the time of flowering. All other agronomic practices like irrigation and insecticidal sprays were kept normal and uniform for all the treatments. To record data on dry weight of weeds a unit area of 1m x 1m was selected randomly from each plot at two different places. Weeds were harvested and dried in an oven at 70°C for 72 hours and dry weight was recorded. For obtaining data on number of sympodial branches and number of mature bolls, 10 plants were randomly selected from each plot and the average was computed per each plot. Twenty bolls were selected at random from each plot to record data on seed cotton weight per boll. The seed cotton yield was recorded on plot basis and then computed on hectare basis.

The data collected were analyzed statistically by analysis of variance and least significant test at 5% probability level was employed to compare the treatments means (Steel & Torrie, 1980).

Results and Discussion

The results show that the effect of sowing methods on dry weight of weeds, yield and yield components of cotton was non-significant (Table 1).

Dry weight of weeds per unit area: The main weeds found in experiment were *Cyprus rotundus* (Deela) and *Trianthema partulacastrum* (Itsit). Different herbicidal treatments produced significantly lower dry weight of weeds over the control. Minimum dry weight of weeds (22.12g) was recorded in s-metolachlor @ 2.40 kg a.i.ha^{-1} which however, remained statistically at par with that of s-metolachlor @ 1.92 kg a.i.ha^{-1}. Similarly, all doses of pendimethalin were found not differing statistically from one another. The significantly greater dry weight of weeds were recorded in case of weedy check.. The minimum dry weight of weeds in case of s-metolachlor can be attributed to low weed density due to better weed control. The significantly more weed dry weight in plots where pendimethalin was applied than s-metolachlor could be due to larger population of

Cyprus rotundus which was not controlled by pendimethalin. Presence of weeds in weedy check throughout the growing season make best use of resources and resulted in more dry weight of weeds. These results are supported by those of Awan (1990) and Tatla (1993) who concluded that the plot treated with metolachlor @ 2 kg ha^{-1} produced the minimum dry weight of weeds.

Number of sympodial branches per plant: All herbicides produced statistically similar number of sympodial branches per plant, whereas in weedy check significantly lesser number of sympodial branches per plant (15.97) were recorded. Minimum number of sympodial branches in weedy check could be due to presence of weeds through out the season which competed with crop plants for growth factors and decreased their share. These result are similar to those of Zaki *et al.*, (1988) and Tatla (1993) who observed that herbicide treated plot produced maximum number of sympodial branches per plant.

Number of mature bolls per plant: The herbicidal treatments produced significantly higher number of mature bolls per plant over the controls. The number of mature bolls per plant was highest (28.35) with the application of s-metolachlor @ 1.92 kg $a.i.ha^{-1}$, which differed significantly from all other treatments. It was followed by s-metolachlor @ 2.40 kg $a.i.ha^{-1}$ and all doses of pendimethalin which were statistically similar to one another. Significantly (p 0.05) minimum number of mature bolls per plant (13.43) were recorded in weedy check . Greater number of mature bolls in herbicides applied plots might be due to better weed control than weedy check. Awan (1990) and Tatla (1993) also reported increase in number of harvested bolls with the application of herbicides.

Seed cotton weight per boll: There were significant differences among the treatments under study. The plots treated with s-metolachlor @ 1.92 kg $a.i.ha^{-1}$ resulted in maximum seed cotton weight per boll (3.68g) however, remained statistically at par with that of s-metolachlor @ 2.40 kg $a.i.ha^{-1}$ and pendimethalin @ 0.89 kg $a.i.ha^{-1}$. Minimum seed cotton weight per boll was recorded in weedy check which did not differ statistically from pendimethalin @ 1.03 kg $a.i.ha^{-1}$ and pendimethalin @ 1.11 kg $a.i.ha^{-1}$. These observations are almost in line with the results of Awan (1990) who reported maximum seed cotton weight per boll as a result of metolachlor + fluometuron @ 2 kg ha^{-1}.

Seed cotton yield: There was a significant increase in the yield of the seed cotton per hectare in plots treated with herbicides over the control. The highest yield of 1450.74 kg ha^{-1} was obtained in plots treated with s-metolachlor @ 1.92 kg $a.i.ha^{-1}$ but remained statistically at par with that of s-metolachlor @ 2.40 kg $a.i.ha^{-1}$, pendimethalin @ 0.89 & 1.11 kg $a.i.ha^{-1}$. The significantly (p 0.05) minimum seed cotton yield per hectare (547.39kg ha^{-1}) was noted in weedy check. Decrease in seed cotton yield in weedy check might have resulted from more dry weight of weeds, less number of sympodial branches per plant and number of mature bolls per plant. These results support the finding of Oviedo Zamora & Velasquez (1987), Tatla (1993) and Panwar *et al.*, (1995).

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(Received for publication 2 November 2000)