Weed Control in Sugarcane

Hidayat-ur-Rahman*, Khan Zada**, Said Rahman*** and Ghulam Sarwar Khan***

ABSTRACT

The comparative effect of three herbicides i.e, Gesapex combi (atrazine + ametryn), Stomp (pendimethalin) and Tribunal (methabenzthiazuron) in various combinations, uprooting and hoeing, on weed control, trash and cane yield as well as sugar recovery were studied during the years 1980-81 and 1981-82. These investigations showed that the weed control was 30.33% with hand weeding and hoeing while with various herbicides 71% control was observed. Trash yield was significantly decreased by the application of herbicides with the exception of lower doses which increased the trash yield upto 1.79 t/ha. A similar increase was also observed in the cane yield with the application of various herbicides during 1980-81 and 1981-82, respectively. Uprooting and hand hoeing did not show a marked increase in the cane commercial sugar percentage (CCS). However, a significant increase upto 10.98% in CCS was observed through the application of herbicides.

INTRODUCTION

Although sugarcane is grown extensively in the country but the present yield level is far below the level obtainable with the application of modern agro-techniques. This crop has a great potential for high yield and if managed properly, can go a long way to meet the increasing requirements of the country.

Weeds constitute one of the biggest problem in its cultivation. They rob the soil of available moisture and nutrients and compete for space and light with the crop plants and consequently reduce the yield and market value of farm produce. They also serve as alternate hosts for plant diseases and pests.

It has been observed that yield potential in sugarcane decreases from 10-17 percent due to the presence of weeds (Anonymous 1969) and crop yield can be increased by 16-20 percent with suitable control measures. (Ahmad and Akhtar 1978). Eradication of weeds has been carried on from time immemorial by hand labour or by animal drawn implements. These methods besides being laborious and tiresome are expensive due to the increased cost of labour and growing mechanization of farm operations and as such have stimulated interest in the use of chemical weed control. Weed eradication has been reviewed by various workers like Turner (1977), Bashir (1978), Clement *et al* (1979), Diaz *et al* (1980), Millhollon (1980), Peng (1980), Richard and Kitchen (1983), Tilley (1984) and Makepeace and William (1986). In view of the aforesaid evidences and observa-

* Part of the M.Sc. thesis submitted by the senior author to the N.W.F.P., Agricultural University, Pashawar.

** Department of Agronomy, N.W.F.P., Agricultural University.

*** Sugar Crop Research Institute, Mardan.

tions, this experiment was designed to study the impact of different cultural (hand hoeing and up-rooting) and herbicidal treatments applied early post emergence of weeds and pre-emergence of sugarcane, on the yield and quality of sugarcane and population size of weeds.

MATERIALS AND METHODS

The experiment was conducted at the student research farm, N.W.F.P, Agricultural University, Peshawar during the year 1980-81 and 1981-82. Three herbicides viz Gesapex combi @ 2, 4, 6, Stomp @ 1.0, 1.5, 2.0 and Tribunal @ 1.0, 2.0 and 3.0 kg ha^{-1} were tested each year in different combinations, in a randomized complete block design with three replications. Sugarcane variety N.Co 310 was planted on 15th of November during both the years. Each plot measured 6 x 3 meter with 4 rows each 0.8 meter apart in experimental area appropriate to the design. The herbicides were applied as spray treatment in a spray volume of 400 litre/hectare, using a knapsack sprayer equipped with one nozzle beam. The herbicides were applied at early post emergence of weeds and pre-emergence of cane.

The data regarding the weed control (%), trash yield, cane yield and cane commercial sugar (CCS) were recorded and statistically analysed. (Steel and Torrie, 1980).

Brix reading and pole percent were determined according to the method prescribed by Brown and Zarban (1962). Regular observations were made to see any phytotoxicity to sugarcane. Total weeds growing in a square meter area at three random places were counted by means of a square meter wooden frame. The counts were made 5 weeks after the spray to assess the extent of killing weeds in each treatment. The crop for the year 1980-81 was harvested on 15 January, 1981, while that for 1981-82 was harvested on 10th January, 1982.

RESULTS AND DISCUSSION

Weed control

Most of the weed population consisted of annuals with the exception of three perennials viz *Sorghum halepense*, *Convolvulus*, and *Cyperus rotundus*. The existing weeds in plots were *Aphanes arvensis*, *Capsella bursa-postoris*, *Amaranthus* sp, *Poa annua*, *Rotoflexus* and *Euphorbia* sp.

Herbicides application significantly controlled the weed population in sugarcane during both the years (Table 1). In up-rooting and hoeing plots, the control was 27% and 30.33% during 1980-81 while during 1981-82, it was 33% and 28% respectively. After irrigation, weeds like *Brassica* spp. *Vicia sativa*, *Aphanes arvensis* and *Cyperus rotundus* resprouted. As regards the application of herbicides, the control of weeds was 71.66% and 70%. The weeds which were readily killed by the herbicides were *Aphanes arvensis*, *Fumaria* sp, Milk thistle (*Silybum marianum*) and *Euphorbia* sp. The weeds *Cyperus rotundus*, *Convolvulus*, foxtail (*Setaria* sp.) and *Sorghum halepense* were not readily affected, by the herbicides. They

Table 1. Effect of herbicides on percentage weed control during the year 1980-81 and 1981-82.

Herbicides (kg/ha)			Percentage Weed Control	
Gesapex combi	Stomp	Tribunil	1980-81	1981-82
2.0	1.0	1.0	26.7j	28.0g
2.0	1.0	2.0	41.7h	41.7defg
2.0	1.0	3.0	31.3ij	29.7fg
2.0	1.5	1.0	32.0i	32.7efg
2.0	1.5	2.0	29.0ij	30.0fg
2.0	1.5	3.0	52.7ef	53.7abcd
2.0	2.0	1.0	62.7c	61.3abc
2.0	2.0	2.0	60.3c	62.0abc
2.0	2.0	3.0	63.3bc	68.0a
4.0	1.0	1.0	29.0ij	29.7fg
4.0	1.0	2.0	62.7c	64.0ab
4.0	1.0	3.0	29.3i	30.0fg
4.0	1.5	1.0	49.3fg	51.3abcde
4.0	1.5	2.0	59.7cd	62.3abc
4.0	1.5	3.0	57.0de	59.0abc
4.0	2.0	1.0	27.0ij	29.0fg
4.0	2.0	2.0	63.7bc	67.0ab
4.0	2.0	3.0	59.7cd	59.7abcd
6.0	1.0	1.0	68.3ab	70.0a
6.0	1.0	2	71.7a	69.0a
6.0	1.0	3	48.7fg	44.0cdefg
6.0	1.5	1	61.0c	59.7abcd
6.0	1.5	2	54.3def	52.7abcde
6.0	1.5	3	32.0i	31.7efg
6.0	2.0	1	59.0cd	61.7abc
6.0	2.0	2	46.3gh	48.3bcdef
6.0	2.0	3	29.3ij	33.7efg
Hoeing	-	-	30.3ij	33.0efg
Uprooting	-	-	27.0ij	28.0g
Control	-	-	0.0-	0.0-

Means followed by different letters are significantly different at 5% level.

persisted for long time. These investigations talley to the results of Bashir (1978), Imran and Pazir (1979), Clement *et al* (1979), Peng (1980), Ibrahim (1982), Richard and Kitchen (1983) and Makepeace and William (1986). Hand hoeing was not found to affect complete eradication of weeds. It was also observed that the field in which the herbicidal control was practiced in the first year, the weed population in the following year was significantly low.

Trash yield

The data given in table 2 show the significant effect of herbicides on trash yield for both the years. The application of herbicides reduced the trash yield during both the years. Maximum reduction in trash yield of 1.04 t/ha and 1.10 t/ha was observed with the application of herbicides during 1980-81, A mixture of Gesapex combi, (6 kg/ha) and Tribunal (2 kg/ha) gave the maximum trash yield of 1.79 t/ha in 1980-81 while during 1981-82 Gesapex combi (6 kg/ha) + Stomp (1.5 kg/ha) + Tribunal (1 kg/ha) gave the highest yield i.e., 1.65 t/ha. It is also evident from table 2 that during 1981-82 up-rooting and hoeing was found to produce lower trash yield than herbicidal application. However, the hoeing practice during 1980-81, gave better results over up-rooting and control. These results coincide with the results of Imran and Pazir (1979), Millhollon (1980), Coster et al (1981) and Tilley (1984).

Cane yield

Sugarcane yield was significantly affected by the application of herbicides during both the years (Table 3). The maximum cane yield of 60.53 t/ha was recorded from the treatment of Gesapex combi (6kg/ha) + Stomp (1kg/ha) + Tribunal (1 kg/ha) during 1980-81. During 1981-82, Gesapex combi (6 kg/ha) + Stomp (1 kg/ha) + Tribunal (1 kg/ha) gave the highest cane yield of 64.29 t/ha. Gesapex combi and Tribunal acted as growth activating harmones which enhanced the crop growth with low phytotoxicity at higher rate of application. Similarly hoeing and uprooting also showed a marked increase in cane yield during both the years. These studies are in close agreement with the findings of Turner (1977), Imran and Pazir (1979), Peng (1980), Narwal and Malik (1982).

Cane commercial sugar percentage

Uprooting and hoeing did not show any marked increase in cane commercial sugar percentage during both the years. However, a slight increase in CCS percentage was recorded through hoeing practice during 1980-81 (Table 4). With the application of herbicides a significant increase in sugar recovery (upto 10.98%) was recorded during 1980-81 while the highest percentage of 10.90% CCS was obtained during 1981-82. The data also show that Tribunal gave better performance than the other two herbicides in combination, making allowance for the herbicides for better weed control. Secondly the herbicides acted as growth regulating harmones due to which sugar recovery was increased. Imran and Pazir (1979) obtained similar results with the application of Gesapex combi, Gramexone and Sencor combi alone

Table 2. Effect of herbicides of trash yield of sugarcane crop during the years 1980-81 and 1981-82

Herbicides (kg/ha)			Trash yield (t/ha)	
Gespex combi	Stomp	Tribunil	1980-81	1981-82
2.0	1.0	1.0	1.5 cd	1.3 bcde
2.0	1.0	2.0	1.2 fgh	1.6 a
2.0	1.0	3.0	1.1 gh	1.5 abcd
2.0	1.5	1.0	1.2 gh	1.5 ab
2.0	1.5	2.0	1.4 def	1.6 ab
2.0	1.5	3.0	1.2 fgh	1.2 cde
2.0	2.0	1.0	1.4 de	1.6 ab
2.0	2.0	2.0	1.4 de	1.6 a
2.0	2.0	3.0	1.2 efg	1.2 cde
4.0	1.0	1.0	1.1 hi	1.6 ab
4.0	1.0	2.0	1.7 abc	1.3 bcde
4.0	1.0	3.0	1.5 cd	1.2 cde
4.0	1.5	1.0	1.7 abc	1.7 a
4.0	1.5	2.0	1.6 bcd	1.2 de
4.0	1.5	3.0	1.2 gh	1.3 abcd
4.0	2.0	1.0	1.7 a	1.2 cde
4.0	2.0	2.0	1.0 gh	1.4 abcde
4.0	2.0	3.0	1.6 bcd	1.2 cde
6.0	1.0	1.0	1.2 fgh	1.3 bcde
6.0	1.0	2.0	1.8 ab	1.5 abc
6.0	1.0	3.0	1.5 bcd	1.1 e
6.0	1.5	1.0	1.7 abc	1.2 de
6.0	1.5	2.0	1.2 efg	1.5 abc
6.0	1.5	3.0	1.2 efg	1.5 abc
6.0	2.0	1.0	1.3 efg	1.5 abcd
6.0	2.0	2.0	1.4 def	1.2 cde
6.0	2.0	3.0	1.4 de	1.3 bcde
Hoeing	-	-	1.7 abc	1.1 e
Up-rooting	-	-	1.5 bcd	1.1 e
Control	-	-	1.5 bcd	1.3 abcde

Means followed by different letters are significantly different at 5% level.

Table 3. Effect of herbicides on cane yield of sugarcane during the year 1980-81 and 1981-82

Herbicides (kg/ha)			Sugarcane yield (t/ha)	
Gesapex combi	Stomp	Tribunil	1980-81	1981-82
2.0	1.0	1.0	30.7lm	30.0hi
2.0	1.0	2.0	43.5fg	43.4cdef
2.0	1.0	3.0	33.6jkl	38.8efgh
2.0	1.5	1.0	37.5ij	36.5efgh
2.0	1.5	2.0	35.1jk	33.6fgh
2.0	1.5	3.0	49.8de	49.7bcd
2.0	2.0	1.0	56.6ab	57.0ab
2.0	2.0	2.0	56.6abc	58.9ab
2.0	2.0	3.0	57.7ab	56.6ab
4.0	1.0	1.0	38.2hi	38.0efgh
4.0	1.0	2.0	49.8de	53.3bc
4.0	1.0	3.0	32.8kl	34.7efgh
4.0	1.5	1.0	40.3ghi	40.1defh
4.0	1.5	2.0	56.6abc	55.0ab
4.0	1.5	3.0	46.5ef	41.0def
4.0	2.0	1.0	43.5fg	43.8ade
4.0	2.0	2.0	55.2bc	54.8ab
4.0	2.0	3.0	53.3bc	52.3bc
6.0	1.0	1.0	60.5a	64.3a
6.0	1.0	2.0	48.4g	41.0defg
6.0	1.0	3.0	41.9gh	38.2efgh
6.0	1.5	1.0	55.2bc	54.5ab
6.0	1.5	2.0	51.5cd	51.2bc
6.0	1.5	3.0	37.5ij	39.3efgh
6.0	2.0	1.0	55.5bc	56.4ab
6.0	2.0	2.0	38.8hi	37.5efgh
6.0	2.0	3.0	32.1kl	33.5gh
6.0	2.0	3.0	32.1kl	33.5gh
Hoeing	-	-	27.6m	31.4ghi
Up-rooting	-	-	27.2m	32.0ghi
Control	-	-	23.1m	24.8i

Means followed by different letters are significantly different at 5% level.

Table 4. Effect of herbicides on cane commercial sugar percentage (CCS%) during the year 1980-81 and 1981-82

Herbicides (kg/ha)			Cane Commercial Sugar Percentage	
Gesapes combi	Stomp	Tribunil	1980-81	1981-82
2.0	1.0	1.0	8.9fghi	8.7ef
2.0	1.0	2.0	10.2abcde	10.4abc
2.0	1.0	3.0	9.2efgh	9.2de
1.0	1.5	1.0	7.9ij	8.9def
2.0	1.5	2.0	10.7ab	10.7ab
2.0	1.5	3.0	10.9a	10.7ab
2.0	2.0	1.0	8.2hi	8.9fg
2.0	2.0	2.0	9.4defg	9.4cde
2.0	2.0	3.0	11.0a	11.0a
4.0	1.0	1.0	10.8ab	10.7ab
4.0	1.0	2.0	9.4cdefg	9.4cde
4.0	1.0	3.0	9.3efgh	9.4cde
4.0	1.5	1.0	8.9fghi	8.9def
4.0	1.5	2.0	8.8fghi	8.8ef
4.0	1.5	3.0	10.7ab	10.7ab
4.0	2.0	1.0	9.4cdefg	9.2ab
4.0	2.0	2.0	8.6ghi	8.8de
4.0	2.0	3.0	8.9fghi	9.2ef
6.0	1.0	1.0	8.3jhi	8.9bcd
6.0	1.0	2.0	10.5abc	10.5ab
6.0	1.0	3.0	9.1efghi	8.0fg
6.0	1.5	1.0	10.6ab	9.8bcd
6.0	1.5	2.0	8.7ghi	8.7ef
6.0	1.5	3.0	10.4abcd	10.9a
6.0	2.0	1.0	9.4cdefg	9.4cde
6.0	2.0	2.0	9.8bcdef	8.9def
6.0	2.0	3.0	8.0i	8.0fg
Hoeing	-	-	9.4defg	7.9fg
Up-rooting	-	-	7.9ij	7.0g
Control	-	-	7.0j	7.9fg

Means followed by different letters are significantly different at 5% level.

and in combination. However, Diaz *et al* (1980), reported the reduced cane yield and sugar yield with the application of Gesapex (80% ametryne) at 2 or 4 kg/ha, Asulox (40% asulam) + Animal (45% 2, 4-D) at 10 + 2.5 kg/ha of plant crop and two ratoon crops of spring plantation.

REFERENCES

Ahmad, F. and Akhtar, M. 1978. Eradication of weeds from crop field. Zaraat Nama. 17(21): 19-20.

Anonymous. 1969. Smaller farm land yield more. Agriculture Hand Book. F.A.O. Rome Italy: 31.

Bashir, M.E. 1978. Herbicides for weeds control in sugarcane in Sudan. International Sugar Journal. 80;(955): 195-197.

Brown. L. and Zarban. N. 1962. Sugar Industry. 3rd. Edition. Burgess Publishing Co: Minnesota, U.S.A.

Clement, A.A.; Lammel, J.S.; Filho, J.A. and Barbosa, J.C. 1979. Weed control in sugarcane with hexazinone alone or mixed with diuron preemergence. Planta Daninha 2(2):85-88.

Coster, S.K; Findlay, J.B.R. and Van. Der, Schams, C. 1981. A contribution of tebuthiuron and diuron for weed control in South African sugarcane. Proceedings 55th Annual Congress, South African Sugar Technologist Association, Mount Edge Combe, South Africa: 106-110.

Diaz, J.C.; Naranjo, F. and Rodrigue, N. 1980. Tolrance of sugarcane CV.MY 129 to ametryne, asulam, DCMU, dalapon, and 2,4-D herbicides. Ciencias de La Agriculture. No.7:99-107.

Ibrahim, A.A.S, 1982. Efficiency of some herbicides for weed control in sugarcane. Tropical pest Management. 28(3). 255-258.

Imran, M. and Pazir, M. 1979. Evaluation of different herbicides for controlling weeds in sugarcane. Frontier Journal of Agri. Res. Vol. 17:3-19.

Makepeace, P.K. and William, R.C. 1986. Screening trials for the evaluation of herbicides for use in sugarcane. Proc. Australian Soci; Sugarcane Tech: 103-108.

Millhollon, R.W. 1980. Johnson grass (*Sorghum halepense*) control and sugarcane tolerance from pre-emergence treatments with hexazinone. Proc. 17th Congress of International Sugarcane Technologists Vol. I, 68-75.

Narwal, S.S; and Malik, D.S. 1982. Chemical weed control in autumn planted sugarcane. Pesticides. 16(10)33-35.

Peng, S.Y. 1980. Isouron & Velpar in a new criterion for field evaluaton of herbicides. Taiwan Sugar. 27(3) 94-99.

Richard E.P; and Kitchen, L. 1983. Chemical fallow for weed control in sugarcane fields. Abstract meetings of the Weed Science Society of America: 4-5.

Steel, R.G.D. and Torrie, G.H. 1980.

Principles and procedures of statistics. MC. Graw Hill Book Inc. New York.

Tilley, L.G.W. 1984. Investigation in the chemical control of weed grown in cane field in the Bundaberg District, Proc. Australian Soci. Sugarcane Tech. 127-134.

Turner, P.E.T. 1977. Results of three post emergence herbicide screening trials. In proceedings of the South African Sugar Technologists Association I-6.