Pak. J. Weed Sci. Res. 13(3-4): 191-198, 2007

IMPACT OF WEED MANAGEMENT PRACTICES ON GROWTH AND YIELD OF SOME LOCAL GENOTYPES OF ONION

Muhammad Saleem Jilani[1], Muhammad Ramzan and Kashif Waseem[2]

ABSTRACT

Three local genotypes of onion viz Bilot kacha, Dark Red and local Panyalla were used in the study. Two herbicides; pendimethaline 33% E.C @ 3.125 and S-metolachlor 960 EC @ 2.5 L ha^{-1} alongwith two hand hoeing treatments (single hand hoeing 25 days and three hand hoeing 25, 50 and 75 days after transplanting) and a control treatment were compared for weed control and their effect on the yield and yield components of onion. Onion varieties did not show any significant difference for weed density, weed biomass, bulb diameter, bulb weight and bulb yield ha^{-1}. Among the weed management strategies, three hand hoeings practice showed the best results followed by pendimethaline in bulb diameter, bulb weight, and bulb yield ha^{-1}. It is to concluded from the data that the three onion varieties did not differ in their competitive ability with weeds and had the similar yield potential. Among the herbicidal treatments, three hand hoeings proved to be the best weed control practice. The herbicide pendimethaline performed equally good with the 3 hoeings. Therefore, these top scoring treatments in our studies are recommended for onion weed management in Dera Ismail Khan.

Keywords: Onion, *Allium cepa* L., pendimethaline, S-metolachlor, Hand hoeing, weed biomass, bulb, yield.

INTRODUCTION

Production of onion has a pronounced impact on the economy of Pakistan. The yield of onion is very low in Pakistan as compared to

[1]Department of Horticulture, Faculty of Agriculture, Gomal University D.I. Khan, NWFP, Pakistan.

[2] Corresponding author's e-mail address: waseem_hort@yahoo.com

other advanced agricultural countries of the world. One of the most important reasons for the poor yield of onions is the excessive weed competition.

It has been shown that farmers are using various strategies to control weeds, however, they mainly depend hand weeding and on the use of substituted urea based herbicide Tribunil (Defoer and Nieuwkoop, 1991). Weeds were ranked as the most serious problem in onion production in NWFP, Pakistan. Weed control is the most important production practice in crop husbandry (Aness, 1994). Weeds compete with the crop plants more at early stages. Usually farmers do not weed early enough to prevent major damage caused by the competition. There are several methods for weed control in crops which include cultural, mechanical, chemical and biological. Research has indicated that many herbicides can be used effectively and selectively to control weed onion. Orkwor (1983) reported that weed infestation significantly reduced crop vigor, leaf production, bulb diameter and consequently bulb yield in onions. Hassan and Malik (2001) reported that cultural control (four hand weeding) is the best for weed control because it provides maximum weeds control in tested crop. Jilani *et al.,* (2003) reported that three hand weeding proved superior in decreasing weed density, followed by pendimethaline and S- metolachlor, respectively. Nargis *et al.,* (2006) suggested that pendimethaline proved to be the best herbicide in controlling weeds in onion field, by producing maximum sized bulbs and highest yield. Keeping in view the damage caused by the weeds in the onion fields, present study was carried out to evaluate the best proper method of weed elimination in onion field using manual and chemical weeding techniques.

MATERIALS AND METHODS

A research project entitled “Impact of weed management practices on growth and yield of local genotypes of onion” was carried out the Horticulture Research Area, Faculty of Agriculture, Gomal University, Dera Ismail Khan during 2003 –2004. The experiment was laid out in a split plot design with three replications, randomizing the varieties in main plots while weeding methods in sub plots. Three different varieties of onion were used viz., Bilot katcha local, Dark Red and Panyalla local. The sub plots consisted of herbicide treatments including weedy check (Control), Single hoeing 25 days after sowing, Thrice weeding 75 days after sowing, pendimethaline @ 3.135 and S-metolachlor 960 EC @ 2.5 L ha^{-1}. Each sub plot size was 2.25 m^2 having the distance of 10 cm and 30 cm between rows and plants, respectively. Pendimethaline and S-metolachlor were sprayed

immediately after transplanting. First hand weeding was applied 25 days after transplanting while the second and third hand weedings were applied 50 and days after transplanting.

Data were recorded on weed density (m^{-2}), fresh and dry weed biomass (g m^{-2}), number of bulbs per plot, bulb diameter (cm), weight $bulb^{-1}$ (g), and bulb yield (tons ha^{-1}). The data collected were analyzed statistically using analysis of variance technique as described by Steel and Torrie (1984). The procedure of Duncan's multiple range test (Duncan, 1955) was adopted to detect the statistical differences among treatment means. The statistical analysis was computed using MSTAT program.

RESULTS AND DISCUSSION.

Weed Density (m^{-2})

Different varieties did not differ significantly, but numerically more number of weed m^{-2} were recorded in *cv.* Bilot katcha local whereas the number of weeds in varieties Dark Red and Panyalla local were almost similar (Table-1). The application of pendimethaline @ 3.125 L ha^{-1} significantly controlled weeds as it contained the lowest (0.4) number of weed m^{-2} followed by S-methachlor with 3.0 weeds m^{-2}. Statistically both treatment were at par with each other. Our results are supported by the previous findings of Marlow (1985) and Kothayri and Hassan (1990) who also recommended pendimethaline for reducing weeds population and obtaining good yield in onion.

Fresh Weed Biomass (g m^{-2})

Although the fresh weed biomass of onion recorded for different varieties didn't show significant behavior, yet it amended to 17.1, 14.5 and 12.9 g/ plot for cv Bilot Katcha local, Panyalla local and Dark Red, respectively (Table-1). The fresh weed biomass produced by weed management practices differed significantly and the minimum fresh weed biomass yield (0.3 g m^{-2}) was obtained in pendimethaline followed by S-metolachlor with fresh weed biomass of 3.3 g. The maximum fresh weed biomass (28.4 and 25.9 g m^{-2}) was harvested from control treatment and one hand hoeing and both these treatments were statistically alike. These results are in accordance with the findings of Verma and Singh (1997) and Nargis *et al.,* (2006) who stated that pendimethaline had reduced the fresh as well as dried weed biomass in onion fields. The reason for higher fresh weed biomass in control and one hand hoeing may be due to the fact that the weed removal in these plots were very low as compared to the

others and thus higher fresh weed biomass was reported in these plots.

Dry Weed Biomass (g m^{-2})

Similar trend in data was recorded for dried weed biomass/m2 (g) as was observed for fresh weed biomass. Varietal differences did not influence dried weed biomass whereas different weed management practices significantly affected the dry weed biomass (Table-1). Dried weed biomass of 2.98, 2.42 and 2.19 g m^{-2} was reported from Bilot Katcha local, Panyalla local and Dark Red, respectively. Amongst various weed management practices, the minimum dried weed biomass 0.04 and 0.26 g were recorded in pendimethaline and S-methachlor, respectively and both the treatments were statistically at par. Maximum dried weed biomass (6.3 g) was harvested from control plots. Verma and Singh (1997) and Nargis *et al.,* (2006) also reported that herbicides reduced the fresh as well as dried weed biomass in onion.

Table- 1. Effect of different onion genotypes and weed control methods on weed density (m^{-2}), fresh and dry weed biomass (g m^{-2}), number of bulbs per plot and bulb diameter (cm).

Varieties	Weedy check	One hand weeding	Three hand weedings	Pendim ethline	S-metol achlor	Varieties Mean
Weed Density (m^{-2})						
12.5	8.3	0.7	4.3	8.8 $^{N.S}$	58	62.0 $^{N.S}$
15.5	7.2	0.7	2.0	7.2	59	61.9
13.1	8.9	0.0	2.7	7.4	63	65.7
13.7 a	8.2 b	0.4 c	3.00 c		60.3 b	
Fresh Weed Biomass m^{-2} (g)						
Bilot Katcha local	36.6	25.4	19.3	0.5	3.5	17.1 $^{N.S}$
Dark Red	21.5	26.2	14.2	0.5	2.0	12.9
Panjyalla local	27.1	26.1	14.9	0.0	4.3	14.5
Mean	28.4 a	25.9 a	16.2 b	0.3 c	3.3 c	
Dry Weed Biomass m^{-2} (g)						
Bilot Katcha local	8.60	2.90	2.40	0.08	0.20	2.98 $^{N.S}$
Dark Red	5.00	3.70	2.10	0.04	0.09	2.19
Panyalla local	5.40	4.30	1.90	0.00	0.40	2.42
Mean	6.33 a	3.69 a	2.18 b	0.04 c	0.26 c	

Means followed by different letters show significant differences for each parameter in the respective category by LSD at 5% level of probability.

$^{N.S}$ = Non-significant

LSD value of Weed control treatments for weed density (m^{-2}) =3.1

LSD value of Weed control treatments for Fresh Biomass (g m^{-2}) =5.4
LSD value of Weed control treatments for Dry Biomass (g m^{-2}) =1.61

Number of bulbs/plot

Different onion varieties did not differ significantly in number of bulbs produced per unit area. However, maximum number of bulbs/plot (65.7) were produced in Panyalla local variety followed by Bilot katcha local and Dark Red, producing 62.0 and 61.9 bulbs/plot, respectively. Different weed management strategies significantly affected the number of bulb/ plot as shown in Table-2. Maximum bulbs/plot (70.6) was reported in three hand hoeing treatment followed by pendimethaline with 66.2 bulbs/plot and both the treatments were similar in their effect on No. of bulbs, but significantly different from the other three treatments. The minimum number of bulbs/plot (57.7) were noted in control plot and this treatment was statistically similar to one hand hoeing and s-metolachlor. Similar results were obtained by Jilani *et al*., (2003) reporting that three hand weeding produced maximum No. of bulbs/ plot in onion. The reason for having lowest number of bulbs/plot in the control treatment may be due to the presence of higher number of weeds which competed with the onion bulbs for light, water, space and nutrients.

Bulb diameter (cm)

Onion varieties did not show significant differences in their bulb diameter, however, data in Table-2 depicted that bulbs of maximum diameter (5.2 cm) were obtained from cv. Panyalla local followed by Bilot Katcha local and Dark Red with 5.1 and 5.0 cm diameter, respectively. Different weed management practices however, had significant effect on onion bulb diameter. The bulbs with maximum diameter (5.8 cm) were reported in three hand hoeing treatment, followed by pendimethaline producing bulb diameter of 5.6 cm. Both treatments showed similar effects on bulb size. The lowest bulb diameter (4.5 cm) was obtained from control plot, which was statistically similar to the bulb diameter (4.6 cm) recorded in one hand hoeing. These results are in agreement with the findings of Hassan and Malik (2002) and Jilani *et al.,* (2003) who reported that maximum bulb diameter in onion was obtained in three hand hoeing as compared to the herbicides and weedy check.

Weight $bulb^{-1}$ (g)

The results shown in Table-2 clearly depict that different onion varieties did not differ significantly from each other for weight of bulbs. The heaviest bulb weight (66.2 g) per bulb was produced in Panyalla local followed by Dark Red and Bilot Katcha producing bulb weight of 61.5 and 58.8 g, respectively. Different weed management practices

had profound effect on the weight of bulbs. Once again the supremacy of three hand hoeings was unbeaten, as it produced bulbs of the maximum weight (77.0 g) followed by pendimethaline producing bulbs of 70.4 g. Both the treatments were statistically at par. S-metolachlor and one hand hoeing treatments produced bulbs of the medium size having the statistically similar weight (60.3 and 53.4 g). The lowest bulb weight (49.0 g) was recorded in control treatment. These results are corroborated with the work of Dunan *et al.,* (1996) and Nargis *et al.,* (2006) who also reported that amongst different herbicides, pendimethaline proved to be superior in producing maximum onion bulb size.

Bulb Yield (tons ha^{-1})

Although varietal effect on onion yield (tons ha^{-1}) was non-significant statistically, yet cv. Panyalla local produced the highest yield (14.1 t ha^{-1}) whereas Bilot Katcha and Dark Red also gave closer yields (13.0 and 12.9 t ha^{-1}) [Table-2]. However, statistically significant differences were deciphered for different weed management treatments. The data show that three hand hoeings and pendimethaline produced significantly higher and similar yields (15.4 and 14.4 t ha^{-1}), while one hand hoeing, S-metolachlor and the weedy check gave statistically similar yields (12.8, 12.5 and 11.8 t ha^{-1}). The one hand weeding thus has been inadequate in addressing the season long weed problem, so it failed to surpass in yield from the weedy check. These results are also supported by the previous findings of Banafer and Guar (2000), Jilani *et al., (*2003) and Nargis *et al.,* (2006), who obtained better yield with various herbicides through the better management of weeds.

Conclusions

It is to concluded that the three onion varieties did not differ in their competitive ability with weeds and had the similar yield potential. Among the herbicidal treatments, three hand hoeing proved to be the best weed control practice. The herbicide pendimethaline performed wqually good with the 3 hoeings. Therefore, these top scoring treatments in our studies are recommended for adoption.

Table-2. Effect of different Onion genotypes and weed control methods on No. of bulbs m^{-2}, Bulb diameter (cm), weight $bulb^{-1}$ (g) and bulb yield per plot (tons ha^{-1}).

Varieties	Weedy check	One hand weeding	Three hand weedings	Pendim ethline	S-metol achlor	Varieties Mean
			Number of bulbs per plot			
Bilot Katcha local	55	63	70	63	58	62.0 N.S
Dark Red	56	56	71	66	59	61.9
Panjyalla local	62	36	70	69	63	65.7
Mean	57.7 b	61.2 b	70.6 a	66.2 a	60.3 b	
			Bulb Diameter (cm)			
Bilot Katcha local	4.4	4.7	5.8	5.4	4.8	5.1 N.S
Dark Red	4.5	4.4	5.7	5.6	5.0	5.0
Panyalla local	4.5	4.7	5.9	5.8	5.0	5.2
Mean	4.5 c	4.6 c	5.8 a	5.6 a	4.9 b	
			Weight $bulb^{-1}$ (g)			
Bilot Katcha local	49	53.4	77	77.3	60.2	58.8 N.S
Dark Red	51.9	47.4	73.5	75.1	59.7	61.5
Panyalla local	51.7	57.4	82.1	73.5	66.2	66.2
Mean	49.0 c	53.4 bc	77.0 a	70.4 a	60.3 b	
			Bulb yield (tons ha^{-1})			
Bilot Katcha local	11.2	13.17	15.5	13.3	11.8	13.0 N.S
Dark Red	10.5	11.8	15.3	14.5	12.4	12.9
Panyalla local	13.6	13.4	15.2	15.2	13.1	14.1
Mean	11.8 b	12.8 b	15.4 a	14.4 a	12.5 b	

Means followed by different letters show significant differences for each parameter in the respective category by LSD at 5% level of probability.

N.S = Non-significant

LSD value of Weed control treatment for No. of bulbs m^{-2} = 4.9
LSD value of Weed control treatment for bulb diameter (cm) = 0.3
LSD value of Weed control treatment for weight $bulb^{-1}$ = 6.9
LSD value of Weed control treatment for bulb yield tons ha^{-1} = 1.2

REFERENCES CITED

Aness, S.M. 1994. Weed Situation in Balochistan, An overview. Agric. Res. Instt., Quetta, Balochistan, Pakistan.

Banafar, R.S.S. and G.S. Guar. 2000. Influence of weedicides and hand weeding on growth and yield of onion. Indian Cocoa and Spices J. 17 (1-2): 13-14.

Defoer, T. and M.V. Nieuwkoop. 1991. Onion grown in Swat Priorities PATA pub. 86, PATA project, P.O. Box 14, Saidu Sharif, Swat.

Duncan, D.B. 1955. Multiple Range and Multiple F-Tests. Biomet.11:1-42.

Dunan, C.M., P. Westra, F. Moore and P. Chapman. 1996. Modeling the effect of duration of weed competition, weed density and weed competition on seed and irrigated onion. Weed Res.36(3):259-69.

Hassan, S. and F.M. Malik. 2002. Weed management in broad casted onion (*Allium cepa* L). Asian J. Plant Sci. 1(1): 28-30

Jilani, M.S., A. Ghaffoor and S.U. Rehman. 2003. Conventional and chemical control of weeds in five cultivar of transplanted onion (*Allium cepa* L.) Pak. J. Weed Sci. Res. 9 (3-4): 215-224.

Kothayri, G.R. and A.A. Hassan. 1990. Chemical control of annual weeds in irrigated onion in Hadhramount valley. Arab. J. Plant Prot. 8(1):49-54.

Marlow, H. 1985. Now development in weed control in onion. Nachrichten blali her deemp flan zenschutz in del DDR 39 (10); 203-206.

Nargis, B., M.S. Jilani and K. Waseem. 2006. Integrated weed management in different varieties of onion. Indus J. Biol. Sci. 3(1): 678- 684.

Orkwor, G.C.1983. Effect of herbicides on the agronomic characters that control bulb yield. Hort. Absts. 53(5): 3254; 1983.

Steel, R.G.D and J.H. Torrie 1984. Principles and Procedures of Statistics. McGraw Hill Book Co; Inc; New York. PP: 481.

Verma, S.K and T. Singh. 1997. Effect of weed control measures and fertility on growth and productivity of rainy season onion. Indian J. Argon. 42(3): 540-543.