

Efficacy of Cultural and Chemical Weed Control in Transplanted Onion

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Abstract: The conventional hand weeding practices were compared with weedicides (2,4-D, Ronstar and Tribunil) application to control different weeds and to observe the improvement of onion (*Allium cepa*) yield by considering some plant's morphological characters (number, size and weight of bulbs) in transplanted onion. 18 weeds of different families were recorded from the experimental plots. *Ameranthushybridus*, *Convolvulusarvensis*, *Cyperusrotundus*, *Chenopodium album*, *Echinochloa spp.* and *Sophora alopecuroides* were the most damaging. All the treatments (cultural and chemical control methods) had positive significant effect on the weed control and onion yield. Three years field trials revealed that cultural control (four hand weeding) is the best for weeds control in transplanted onion, because it provided maximum weeds control in the tested crop.

Key words: Weeds, transplanted onion, cultural control, Quetta

Introduction

Balochistan is a minor producer of agronomic crops. 0.842 million hectares out of the total area (34 m ha) of the province is under cultivation (Anonymous, 1996-97). Most of the cultivated area is under orchards. 20,047 ha is under onion cultivation which produces 402,443 t ha⁻¹. The average production of onion in Balochistan is 200,75 Kg ha⁻¹ (Anonymous, 1996-97). According to the Research Diagnostic Survey of Vegetables, by Agriculture Research Institute, Quetta, weeds were ranked as the most serious problem in onion production in the province. The weeds problem is becoming worse in irrigated areas where cropping intensity is rapidly increasing and weed management through cultivation practices has become a challenge. The fixed crop rotations has encouraged the establishment of permanent weed flora with large seed reserves in the soil (Anonymous, 1998). Weeds control is one of the most important production practice in farm management (Aness, 1994). Weeds not only cause damage to the crop yield but also utilizes the soil nutrients. The local farmer of Balochistan is not aware of the control methods of weeds in onion (Aness, 1994). Keeping in view the importance of weed management, specially in onion, the study was designed to work out the promising weeds in the crop and to determine the effectiveness of the cultural (hand weeding) and chemical (herbicide's application) control methods to improve the yield of the crop by considering few plant morphological characters of the crop like bulb numbers, size and weight in transplanted onion.

Materials and Methods

The experiments were conducted at Agriculture Research Institute (ARI), Sariab, Quetta and two different locations of private farmers, Kanak and Kalat valleys near Quetta, simultaneously for three consecutive years (1995-97) during Kharif season. Onion transplantation was done in the 1st week of April at ARI while at Kanak and Kalat locations in the last week of March on well prepared seed beds. The seedlings were transplanted at 2-3 leaf stage in 3 x 6 m² plots. Row to row distance was 30 cm while plants were 20 cm apart from one another. Two cultural control methods (two hand weeding, THW and four hand weeding, FHW) and chemical control by three weedicides (2,4-D @ 1.00 L ha⁻¹, Ronstar @ 1.25 L ha⁻¹ and Tribunil @ 2.00 kg ha⁻¹) with a control were the treatments. The experiment was planned using randomized complete block design (RCBD) and onion variety, Sariab Red, was used as test crop. The hand weeding was

done 25 days after weed emergence and continued with 25 days interval till harvest. All the herbicides were applied at 2-3 leaf stage after weed emergence and the mortality percentage of weeds was counted randomly from 1 m² area after 15 days of treatment's application. The harvesting was done in the 1st week of September at ARI and in 2nd week of September at other two locations during all three years. The effectiveness of weed control methods were determined by measuring the yield of the crop as kg/plot and number, size and weight of onion bulbs per plot. Yield of the crop was recorded by weighing all bulbs from each plot in kg/plot and then was converted into t ha⁻¹. The average figures for numbers, size and weight of onion bulbs were recorded by uprooting 30 randomly selected bulbs from each plot. Data was analyzed by MState computer programme using Least Significant Difference (LSD) Test to determine statistical differences among the treatment means.

Results and Discussion

18 weeds from different families were recorded from all the three experimental locations, ARI, Kanak and Kalat (Table 1). *Ameranthus hybridus*, *Convolvulus arvensis*, *Cyperus rotundus*, *Chenopodium album*, *Echinochloa spp.* and *Sophora alopecuroides* were the main weed species infested to the experimental plots. Marwat *et al.* (1992), also discovered few species from genera *Ameranthus*, *Convolvulus*, *Cyperus* and *Sophora* from Quetta valley. The three experimental locations were with in 500 km² area thus the soil and the climate is almost same, therefore having the same vegetation. *Cyperus rotundus* proved itself the most destructive at ARI while *Convolvulus arvensis* on the other two locations (Table 1). All the treatments, cultural and chemical control methods, had decreased the weed's population significantly compared to the control plots at all the three locations (Table 2, 3 and 4). Presence of weeds in the crop effect inversely to the yield of the crop. Smith *et al.* (1992) observed a very healthy interaction between crop and weeds in growth and nutrients up take. Cultural control by hand weeding gave better results than chemical control (Table 2, 3 and 4). Singh and Chandel (1995) and Rathore *et al.* (1990), reported same in Soybean. They claimed that hand weeding increased the crop yield by minimizing the weed population. Four hand weeding checked the weeds population significantly higher than two hand weeding and herbicide's applications (Table 2, 3 and 4). The effect of Ronstar and Tribunil was almost equal for all the aspects, weed's density, number, size, and weight of bulbs and crop yield at all three experimental locations. 2,4-D had

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Table 1: Different weeds recorded in transplanted onion from three experimental locations

Botanical Name of weeds	Local names of weeds	1% infestation at different location		
		ARI	Kanak	Kalat
<i>Ameranthus hybridus</i>	Cholai	++	+++	+++
<i>Ameranthus viridis</i>	Cholai	+	+++	++
<i>Alhagi maurarum</i>	Shinz/Kandiaro	+	++	+++
<i>Adonis aestivalis</i>	----	++	+	+
<i>Convolvulus arvensis</i>	Lehli/Vakarwali	++	++++	++++
<i>Cynadan dactylon</i>	Jangli gahss	++	--	+++
<i>Cyperus rotundus</i>	Malangi	++++	++	++
<i>Chenopodium album</i>	Maririo/Bathu	++	+++	+++
<i>Chenopodium murale</i>	Maririo/Bathu	++	++	+
<i>Descurainia sophia</i>	----	++	+	++
<i>Echinochloa spp.</i>	Bahia/Swanki	+++	++	+++
<i>Lepidum draba</i>	Drub	+	++	++
<i>Malcomia africana</i>	----	+	--	++
<i>Medicago denticulata</i>	----	+	++	+
<i>Malva neglecta</i>	Uthpair	+	+	+
<i>Poa annua</i>	Neli gahss	+	++	+++
<i>Phalaris minor</i>	Dumbi	+	++	+
<i>Sophora alopecuroides</i>	Sondak	+++	++	+++

1% infestation was calculated from the randomly selected samples (n=50) of weed from each plot; ++++ > 75% ++ 51-75%; ++ 25-50%; + < 25% -- not found; ARI= Agricultural Research Institute.

Table 2: Effect of various weed control treatments on weed's density, different morphological characters of onion and crop yield in transplanted onion at ARI during 1995-97.

Treatments	Weed's density (Per msq)	Morphological characters of onion plant			Crop yield (t ha ⁻¹)
		No. of bulbs/Plot	Bulb size(cm)	Bulb weight (gm)	
T1.Control	97.67a ⁻¹	421.0b	20.32c	198.0d	14.73c
T2.THW	18.00c	503.3a	31.65a	433.7a	36.67a
T3.FHW	06.97d	520.0a	33.02a	463.0a	37.97a
T4.2,4-D	30.66b	510.0a	27.94ba	246.7c	30.07b
T5.Ronstar	24.00b	492.0a	30.48a	338.3b	30.30b
T6.Tribunil	24.67b	488.3a	31.32a	350.3b	31.13b

* 1 Lower case letters indicate significant difference down the column using the LSD test value. LSD values for weed density, no. of bulbs, bulb size, bulb weight % crop yield were 10.92, 40.34, 1.59, 50.50 and 3.39 respectively at significance level of 0.01%

Table 3: Effect of various weed control treatments on weed's density, different morphological characters of onion and crop yield in transplanted onion at Kanak location during 1995-97

Treatments	Weed's density (Per msq)	Morphological characters of onion plant			Crop yield t ha ⁻¹
		No. of bulbs/Plot	Bulb Size(cm)	Bulb Weigh(gm)	
T1.Control	105.0a ⁻¹	450.0b	20.32d	175.0c	12.00c
T2.THW	24.00b	515.0a	33.02a	400.0a	35.00a
T3.FHW	14.00c	525.0a	33.02a	425.0a	39.70a
T4.2,4-D	32.00b	490.0a	27.94b	260.0b	26.66b
T5.Ronstar	30.00b	500.0a	25.40c	258.0b	31.33a
T6.Tribunil	28.00b	505.0a	27.94b	260.0b	32.65a

* 1 Lower case letters indicate significant difference down the column using the LSD test value. LSD values for weed density, no. of bulbs, bulb size, bulb weight % crop yield were 9.00, 25.00, 1.50, 40.0 and 4.00 respectively at significance level of 0.01%

Table 4: Effect of various weed control treatments on weed's density, different morphological characters of onion and crop yield in transplanted onion at Kalat location during 1995-97.

Treatments	Weed's density (Per msq)	Morphological characters of onion plant			Crop yield (t ha ⁻¹)
		No. of bulbs/Plot	Bulb Size(cm)	Bulb Weigh(gm)	
T1.Control	100.0a ⁻¹	425.0b	21.59c	200.0c	15.30d
T2.THW	22.00b	510.0a	31.75a	433.0a	35.00b
T3.FHW	16.00c	520.0a	33.02a	440.0a	40.00a
T4.2,4-D	28.00b	500.0a	27.69b	250.0b	29.00c
T5.Ronstar	26.00b	510.0a	27.94b	260.0b	30.00c
T6.Tribunil	27.50b	505.0a	27.21b	255.0b	29.00c

* 1 Lower case letters indicate significant difference down the column using the LSD test value. LSD values for weed density, No. of bulbs, bulb size, bulb weight and crop yield were 8.00, 30.00, 1.50, 45.00 and 3.50 respectively at significance level of 0.01%

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low effect than Ronstar and Tribunil (Table 2, 3 and 4). The heavy bulb size (463 gm, Table 2) was observed in the plot with minimum weeds. Nair *et al.* (1980) observed that presence of weeds reduced the bulb size in onion. Maximum crop yield (40 t ha⁻¹, Table 4) was recorded from Kalat by controlling the weeds by FHW weeding. Aness (1994), reported that presence of weeds in onion crop reduced 50% crop yield. Minimum weeds density (6.97 per m²) and maximum average bulb weight (463 gm) at ARI (Table 2), maximum number of bulbs (525) at Kanak (Table 3) were recorded after four hand weeding. Yadav *et al.* (1988) and Rathore *et al.* (1990) found that the hand weeding has outer edge on chemical control methods of weeds. Hand weeding was done after 25 days interval in this study which provided good results as reported by Yadav *et al.* (1988).

In view of the above discussion it was proved that four hand weeding is the best for weeds control in transplanted onion. By this type of cultural control high yield of the crop could be obtained by minimum atmospheric damage.

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