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Weeds Management in Broadcasted Onion (*Allium cepa*)

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Abstract: The experiment was conducted for the three consecutive years (1995-97) at three different locations (Agriculture Research Institute, Sariab, Quetta and private farms at Kanak and Kalat in Balochistan) simultaneously. The objective was to manage weeds by the conventional hand weeding (two hand and four hand) and weedicides; 2,4-D (Phenoxy acid), Ronstar (Oxadiazon) and Tribunil (Methabenzthiazuron) application in onion (*Allium cepa* L.). Morphological characters of plant (number, size and weight of bulbs) were considered for measuring the crop yield in broadcasted onion. The >14 weeds of different families were recorded from the experimental plots. *Cyperus rotundus* at ARI, Quetta and *Convolvulus arvensis* at the other two locations were the most destructive. *Ameranthus hybridus, Convolvulus arvensis, Chenopodium album, Echinochloa spp.* and *Sophora alopecuroides)* also caused significant damage to the crop yield. All the weeds were significantly controlled by the cultural and chemical control methods. Four hand weeding provided; minimum weed density (11.67) at Kalat, maximum number of bulbs (793) at Kanak, maximum bulb size and bulb weight (21.23 cm and 320 gm, respectively) at ARI, Quetta and the best yield (29.50 tons ha^{-1}) from the experimental plot at Kalat. Cultural control (four hand weeding) is recommended as the best weeds control treatment in broadcasted onion in the province of Balochistan.

Key words: Weed, Broadcasted onion, cultural control, Pakistan

Introduction

According to the Research Diagnostic Survey of Vegetables, by a team of Agriculture Research Institute (ARI), Balochistan, Quetta, weeds were ranked at the top as the most serious problem in onion production in the province. Weeds are becoming worse specially in the irrigated crops. Cropping intensity and fixed crop rotation is rapidly increasing the problem (Aness, 1994). Onion is an important irrigated crop of Balochistan and is cultivated over 20,047 ha (Anonymous, 1996-97). Hashmi *et al.* (1995), reported that not only the field crops but forests and hydro bodies in Pakistan are heavily (>35%) infested by more than 250 weed species, 8 of them are world's worst. Keeping the land free of weeds is essential to get maximum crop production (Upadhyay *et al.*, 1980). Weeds are one of the major factor responsible for the potential yield of onion in Balochistan (Aness, 1994). Weeds not only compete with the host crop but also provides shelter to the insect pests. The local farmers of the Balochistan are not aware to the proper weed control methods (Aness, 1994). Keeping in view, the study was conducted not only to discover the promising weed flora in broadcasted onion but also to evaluate a proper guide line for their management in the particular environment of Balochistan.

Materials and Methods

The experiments were conducted during 1995-97 at three different location of Balochistan (Quetta, Kanak & Kalat) simultaneously, during Kharif season. Agriculture Research Institute, Sariab, (ARI) in Quetta and private farmer's fields at Kanak and Kalat were used as experimental sites. The sowing was done, in the Ist week of March by broadcasting the seeds on well prepared seed beds of 3 x 6 m^2 size, at all three locations. Onion variety, Sariab Red, was used as test crop. Two cultural control methods (two hand weeding, THW and four hand weeding, FHW) and chemical control by three weedicides (2,4-D Phenoxy acid, @ 1.00 L ha^{-1}, Ronstar; Oxadiazon, @ 1.25 L ha^{-1} and Tribunil; Methabenzthiazuron, @ 2.00 kg ha^{-1}) with a control were the treatments. The experiment was replicated three times using randomized complete block design (RCBD). The hand weeding were 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 with Knapsack. The mortality percentage of weeds was counted randomly from 1 m^2 area after 15 days of treatment's application. The harvesting was done in the Ist week of September during all three years at all locations. The effectiveness of weed control methods were determined by measuring the yield of the crop by determining the plant morphological characters (number, size and weight of onion bulbs per plot). Yield of the crop was recorded by weighing all bulbs from each plot in kg and then was converted into tons ha^{-1}. The average figures for bulb number, size and weight were recorded by uprooting of 30 randomly selected bulb from each plot. Data was analyzed by M-Stat computer programme using Least Significant Difference Test (LSD) to determine statistical differences among the treatment means.

Results and Discussion

A total number of 16 weeds from different families were recorded from the experimental plots at ARI and Kalat while 15 from Kanak (Table 1). *Ameranthus viridis, Alhagi maurarum, Malva neglecta, Poa annua* and *Phalaris minor* were the least destructive at ARI, Quetta. *Cynadan dectylon* was not found at Kanak while *Adonis aestivalis, Descurainia sophia* and *Malva neglecta* were found least harmful. At Kalat *Adonis aestivalis, Chenopodium murale, Malva neglecta* and *Phalaris minor* were negligible (Table 1). *Ameranthus hybridus, Convolvulus arvenis, 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. They reported that the environmental conditions, climate and soil texture & structure, affects on the presence of flora in certain areas. All the three experimental location were in same ecological zone thus having almost same vegetation. *Cyperus rotundus* was the most destructive at ARI while *Convolvulus arvensis* on the other two locations.

weed's population was significantly decreased, compared to the control plots, at all the three locations by the treatments, cultural and chemical control (Table 2, 3 and 4). Treated plots provided high yield than control plots. Singh and Chandel (1995), reported that the presence of weeds lowers the yield of the crop. Smith *et al.* (1992) and Aness (1994), observed a significant interaction between crop and weeds for survival. Cultural control by hand weeding out ranked chemical control (Table 2, 3 and 4). Yadav *et al.* (1988), and Rathore *et al.* (1990), also reported that the hand weeding has outer edge on chemical control methods of weeds. Singh and Chandel (1995), reported the same in Soybean. Four hand weeding checked the weeds population significantly higher than two hand weeding and herbicide's applications (Table 2, 3 and 4). Singh and Chandel (1995) and Rathore *et al.* (1990), also observed that hand weeding maximized the crop yield by minimizing the weed population. The results of Ronstar and Tribunil were almost same for all tested factors, weed's density, number, size, and weight of bulbs and crop yield, at all three experimental locations. The 2,4-D had low effect than Ronstar and Tribunil (Table 2, 3 and 4).

Table 1: Different Weeds recorded in broadcasted onion from three experimental locations

Botanical Name	Local Name	*% Infestation at Different Locations		
		ARI	Kanak	Kalat
Ameranthus hybridus	Cholai	++	+++	+++
Ameranthus viridis	Cholai	+	+++	++
Alhagi maurarum	Shinz/Kandiaro	+	++	+++
Adonis aestivalis	--	++	+	+
Convolvulus arvenis	Lehli/Vakarwali	++	++++	++++
Cynadan dectylon	Jangli gahss	++	--	+++
Cyperus rotundus	Malangi	++++	++	++
Chenopodium album	Maririo/Bathu	++	+++	+++
Chenopodium murale	Maririo/Bathu	++	++	+
Descurainia sophia	--	++	++	+
Echinochloa spp.	Bahia/Swanki	+++	++	+++
Lepidum draba	Drub	++	++	++
Malva neglecta	Uthpair	+	+	+
Poa annua	Neli ghass	+	++	+++
Phalaris minor	Dumbi	+	++	+
Sophora alopecuroides	Sondak	+++	++	+++

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

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

Treatments	Weed's Density (per m^2)	Morphological Characters of Onion Plant			Crop yield (tons ha^{-1})
		Number of Bulbs/Plot	Bulb Size(cm)	Bulb Weight(gm)	
Control	180.7a*[1]	300.0d	08.71c	116.7c	14.00d
THW	36.67c	632.3a	17.53b	261.7b	22.00b
FHW	17.67d	636.3a	21.23a	320.0a	24.20a
2,4-D	50.67b	500.0b	15.75c	257.0b	17.57c
Ronstar	51.67b	478.3b	15.41c	242.7b	17.00c
Tribunil	36.33c	548.3b	14.78c	262.0b	20.70b*

*[1]Lower case letters indicate significant difference down the column using the LSD test. LSD values for weed density, no. of bulbs, bulb size, bulb weight and crop yield were 7.63, 56.78, 1.06, 21.53 and 1.75, 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 broadcasted onion at Kanak during 1995-97

Treatments	Weed Density (per m^2)	Morphological Characters of Onion Plant			Crop yield (tons ha^-1)
		Number of Bulbs/Plot	Bulb Size (cm)	Bulb Weight (gm)	
Control	178.0a*[1]	422.0c	08.04e	87.00c	10.93e
THW	41.67c	741.7b	15.62b	225.0a	24.30b
FHW	19.67d	793.3a	16.76a	290.7a	26.70a
2,4-D	55.33b	743.3b	12.62d	260.0b	17.90d
Ronstar	54.33b	750.3b	12.52d	246.0b	19.07d
Tribunil	40.67c	742.3b	13.54c	251.0b	21.93c*

*[1]Lower case letters indicate significant difference down the column using the LSD test. LSD values for weed density, no. of bulbs, bulb size, bulb weight and crop yield were 7.76, 40.22, 0.39, 29.62 & 2.07 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 broadcasted onion at Kalat during 1995-97

Treatments	Weed Density (per m^2)	Morphological Characters of Onion Plant			Crop yield (tons ha^{-1})
		Number of Bulbs/Plot	Bulb Size(cm)	Bulb Weight(gm)	
Control	182.0a*[1]	430.0b	07.60f	90.00d	10.46 c
THW	34.75c	750.0a	15.24b	210.0c	24.00 b
FHW	11.67d	735.0a	16.51a	300.0a	29.50 a
2,4-D	55.00b	760.0a	12.70d	261.0b	23.00 b
Ronstar	52.00b	750.0a	11.43e	250.0b	23.66 b
Tribunil	42.00b	740.0a	13.97c	250.0b	22.00 b*[1]

*[1]Lower case letters indicate significant difference down the column using the LSD test. LSD values for weed density, no. of bulbs, bulb size, bulb weight and crop yield were 7.50, 60.0, 0.40, 30.0 & 4.00 respectively at significance level of 0.01%.

2,4-D has greater leaching property (Thomson, 1986). The structure of soil at all three locations are porus that might effect on the performance of 2,4-D. Through Four hand weeding; minimum weed density was observed at Kalat (Table 4), maximum number of bulbs were obtained at Kanak (Table 3), maximum bulb size and bulb weight were at ARI, Quetta (Table 2) and the best yield was obtained from the experimental plot at Kalat (Table 4). Nair *et al*. (1980), reported that inverse relation are found between weeds and bulb size in onion. Aness (1994), reported that weeds could reduce almost 50% crop yield in onion. The intervel of hand weeding also affects positively to the crop yield (Yadav *et al.*, 1988). 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 in the weed management programme of onion four hand weeding should be prefer. The study dose not disavow the effectiveness of chemical control, as Ronstar and Tribunil had also showed their significant potential in the control of onion weeds, but keeping in view the hazards of environmental pollution by herbicides hand weeding (FHW) is recommended.

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