

## COMPARATIVE EFFICACY OF DIFFERENT HERBICIDES AND THEIR TIME OF APPLICATION AGAINST WEEDS AND YIELD OF BULB ONION

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### Abstract

*Comparative efficacy of different herbicides on the growth and yield of onion local cultivar was carried out. Three herbicides viz Tribunil 70 WP (methabenzthiazuron), Ronstar 12 L (Oxadizon) and probe 75 WP (methazol) each applied at 1, 7 and 14 days after transplanting were evaluated along with hand weeding for the control of weeds and their effect on yield of bulb onion. Different herbicides and hand weeding boosted the onion Yield, plant height, bulb size, bulb weight and reduced the weed density per square meter significantly. Hand weeding out classed rest of the treatments in controlling the weeds and elevated the yield of bulb onion. The herbicides, Tribunil, followed by Probe and Ronstar also proved better and more economical than hand weeding.*

### Introduction

Onion occupies a prominent place among vegetables and is grown commercially throughout Pakistan. The yield of onion in Pakistan is very low as compared to other leading countries of the world. Beside other reasons onion yield is also greatly affected by heavy weed infestation. As reported by Hewson and Roberts (1973) that annual weeds in onion crop reduce the yield upto 60%. Weed control in onion through the use of herbicides has received very little attention in Pakistan in general and in NWFP specially. Hence there is a dire need of developing a package of weed control technology for ready transfer to the farmers. Keeping in view the importance of the problem the present studies were carried out to determine safe, effective and economical use of herbicides in onion crop. These investigations may help in improving the present status of onion production and provide information for the future scientists working in weed management.

Lifshitz *et al* (1992) showed that weed control and yield in onions were best when treated with pendimethalin or ethofumesate+ methabenzthiazuron. Caudal and Morin (1983) recommended propachlor at 4.5 Kg ha<sup>-1</sup> at 1-2 leaf stage of onion followed by 0.3 Kg ioxynil

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+ either 7.5 chlorthal + 0.8 Kg CIPC (chlorpropham) or 1.48 methabenzthiazuron per hectare for weed control in onion. Lagoke and Sinha (1983) studied the effect of application of 10 Kg chlorthal dimethyle, 2 Kg, fluorodifen, 1.5 Kg oxadiazon and 3 Kg propachlor per hectare with or without 1 Kg ha<sup>-1</sup> linuron applied 2 days before transplanting of onion and observed that all the treatments with linuron caused severe phytotoxicity, while treatment with propachlor gave ineffective weed control. Oxadiazon gave most effective weed control, but chlorthal dimethyle and supplementary hoeing 6 weeks after transplanting gave the highest yield of onion. Patel *et al* (1983) found that oxadiazon at 0.5-0.8 Kg alachlor at 1.5-2 Kg and fluchloralin at 0.9-1.3 Kg ha<sup>-1</sup> resulted in increased bulb diameter and yield of onion. Radoi (1984) recommended 1.52 Kg kumiro (linuron) ha<sup>-1</sup> at 2-3 leaf stage, 3 lit. Treflan (trifluralin) ha<sup>-1</sup> applied at 6-7 weeks before planting and 2-4 Kg Tribunil (methabenzthiazuron) ha<sup>-1</sup> immediately after sowing, for the control of weeds in onion. Khurana *et al* (1985) treated onion with 0.75 Kg oxadiazon, 1 Kg fluchloralin or 1 Kg pendimethalin ha<sup>-1</sup> and found excellent broad leaved weed control. They also reported that bulb yield was the highest with oxadiazon followed by methabenzthiazuron. In untreated control the yield was decreased by 54% compared with weed free conditions. Randhawa *et al* (1985) stated that application of 1.25 Kg oxadiazon ha<sup>-1</sup> 1 week after transplanting of onion seedlings, 0.09 Kg fluchloralin ha<sup>-1</sup> + 1 hoeing, 1.4 Kg methabenzthiazuron ha<sup>-1</sup> significantly controlled weeds and increased the bulb yield of onion. Srivastava *et al* (1985) treated bulb onion with 2 liter Basalin (fluchloralin) product ha<sup>-1</sup> pre-planting, 1.2 Kg Tribunil (methabenzthiazuron) ha<sup>-1</sup>, 3 liters Ronstar (oxadiazon) ha<sup>-1</sup> each with 1 weeding at 60 days after planting and found good weed control. They further reported that highest bulb yield was obtained with Ronstar + weeding followed by Tribunil + weeding and two hand weeding. Babiker and Ahmed (1986) reported that application of oxadiazon, pendimethalin, oxyfluorfen and chlorthal dimethyle after transplantation of onion gave excellent and persistent weed control. Nawaz *et al* (1988) applied pendimethalin at 1.5 Kg a.i. ha<sup>-1</sup> and methabenzthiazuron at 1.4 kg a.i. ha<sup>-1</sup> and obtained highest yield of bulb onion. They also observed high cost benefit ratio in case of methabenzthiazuron as compared to rest of the weed control treatments.

## **Materials and Methods**

The experiment was conducted at Faculty of Agriculture, Gomal University, D.I. Khan during the year 1989. Nitrogen at the rate of 100 kg ha<sup>-1</sup> in the form of Urea, Phosphorus at 50 kg ha<sup>-1</sup> in the form of S.S.P, and Potash at 50 kg ha<sup>-1</sup> in the form of Potassium sulphate were applied to the experiment area. Half of the nitrogen and full phosphorus and Potash were applied before transplanting during land preparation and the remaining nitrogen was side dressed six week after transplanting. The experiment was laid out in Randomized Complete Block Design (RCBD) with eleven treatments each replicated four times. The treatments of the experiment were as follows:-

Herbicides Trade Name	Common Name	Active Ingredient	Dose a.i. ha <sup>1</sup>	(Kg) cp ha <sup>1</sup>
Control	-----	----	----	----
Hand weeding	-----	----	----	----
Tribunil*	Methabenzthiazuron	70 WP	1.4 Kg	2 Kg
Tribunil**	Methabenzthiazuron	70 WP	1.4 Kg	2 Kg
Tribunil***	Methabenzthiazuron	70 WP	1.4 Kg	2 Kg
Probe*	Methazol	75 WP	1.2 Kg	1.5 Kg
Probe**	Methazol	75 WP	1.2 Kg	1.5 Kg
Probe***	Methazol	75 WP	1.2 Kg	1.5 Kg
Ronstar*	Oxadiazon	12 L	0.4 Kg	3 Lit
Ronstar**	Oxadiazon	12 L	0.4 Kg	3 Lit
Ronstar***	Oxadiazon	12 L	0.4 Kg	3 Lit

- \* Applied 1 day after transplanting.  
\*\* Applied 7 days after transplanting.  
\*\*\* Applied 14 days after transplanting.

The plot size was 5x2 m. Each plot consisted of 3 rows of 5 m length with row to row distance of 50 cm and plant to plant distance of 20 cm. The crop was transplanted in the second week of February, 1989 on flat soil, sixty nine onion seedlings raised one month before, of local cultivars, were transplanted in each plot. The usual uniform cultural practices and plant protection measures were adopted for raising a successful crop. Hand weeding was started about 20 days after transplanting of onion seedlings in hand weeded plots. Spray of perfection was done at a rate of 100 ml in 100 lit of water ha<sup>-1</sup>, two months after transplanting when the attack of onion thrips was observed. No disease attack was observed during the experiment period. The data recorded on the parameters viz, phytotoxicity, number of weeds, plant height, bulb size, weight, yield and cost benefit ratios, were analysed and significant differences were compared by using Duncan's Multiple Range Test.

### ***Results and Discussion***

The phytotoxicity data on onion seedlings was recorded with an interval of 15 and 30 days after the application of herbicides (Table-1). All the herbicides used at various intervals did not produce toxic effect on onion seedlings. Similarly, Logoke and Sinha (1983) reported that oxadiazon at 1.5 kg ha<sup>-1</sup> applied alone did not produce toxic effect on onion seedlings, but when applied in combination with linuron at 1 kg/ha caused severe phytotoxicity. Different

weed control treatments had significant influence on number of weeds (Table-1). The hand weeded plots showed the least number of weeds per square meter, while maximum number of weeds were recorded in the control plots. Tribunil 70 WP when applied at 14 days after transplanting was next to the hand weeding. It was followed by Ronstar and Tribunil applied at 1 and 7 days after transplanting. Among different herbicides, Probe when applied at 14 days after transplanting had the maximum weed density. These results are in conformity with the finding of Agamalian (1973) who reported that post emergence application of methazole and oxadiazon have controlled weeds selectively in onion. Similarly Khurana *et al* (1985) treated onion with 0.75 kg oxadiazon and 1 kg methabenzthiazuron ha<sup>-1</sup> and found excellent for broad leaved weed control. It clearly indicates that time of herbicides application had positive effect on the plant height of onion (Table-1). Maximum plant height was observed in the hand weeded treatment followed by Tribunil 70 WP when applied at 7 days after transplanting, 14 days after transplanting and 1 day after transplanting, respectively. Ronstar 12 L and Probe 75 WP were found equally effective in increasing the height of plants as compared to untreated ones. The minimum plant height was recorded in the control plots. These findings are in contradiction with Boldt and Putname (1976) who observed that methazole in combination with other herbicides did not affect the height of onion. The bulb size was significantly affected by different weed control treatments at 1% level of probability (Table-1). Maximum bulb size was observed in the hand weeded treatments. It was followed by Tribunil 70 WP when applied at 14, 7 and 1 day after transplanting of onion seedlings. Tribunil 70 WP when applied at various intervals was found significantly better than Probe 70 WP and Ronstar 12 L though probe and Ronstar gave largest size of bulb as compared to untreated one. Among the herbicides, the Probe when applied at 14 days after transplanting gave the smallest size of bulbs, which indicates that the herbicide is suitable for early spray, as it performs well when applied at 7 days after transplanting. These results are in agreement with the findings of Patel *et al* (1983) who found that oxadiazon at 1.3 kg ha<sup>-1</sup> applied after transplanting increased the bulb diameter of onions. The results obtained depict that all the herbicides and hand weeded plots boosted the weight of onion bulb significantly at 1% level (Table-1). Among the treatments, the hand weeding outclassed rest of the treatments by producing onions with highest bulb weight. The herbicide, Tribunil 70 WP performed well in enhancing the weight of bulb onion particularly when applied at 14 days and 7 days after transplanting as compared to other herbicides. Ronstar when applied at 1 and 7 days after transplanting, while probe at 7 days after transplanting also markedly increased the weight of onion bulb and were found at par. The lowest weight of onion bulb was observed in the unweeded plots. These findings are in agreement with those of Wicks *et al* (1973) who reported that early weed control gave better results. The data also indicated that different herbicides and hand weeded treatments significantly boosted the yield of bulb onion (Table-1). The lowest bulb yield was obtained in the unweeded plots. Hand weeding out yielded rest of the treatment by giving highest average yield of 7200 kg ha<sup>-1</sup>. It was followed by Tribunil 70 WP when applied at 14, 7 days after transplanting and found at par with each other, but differed significantly from Ronstar 12 L and Probe 75 WP. Similar findings were reported by Nawaz *et al* (1988) that Tribunil 70 WP gave the yield of bulb onion comparable to hand weeding. Similarly, Babiker and Ahmed (1986) reported that application of oxadiazon (Ronstar) just after transplanting gave better and persistent weed control and resulted in highest bulb yield of onion.

Table 1. Effect of various herbicides on weed density

Weed Treatment	Number of weed/plot	Plant height (cm)	Bulb Size (cm)	Bulb Weight (gm)	Yield (Kg ha <sup>-1</sup> )
Control	36.15 a	38.86 f	3.74 g	65.00 c	3950 d
Hand weeding	02.02 g	49.80 a	6.93 a	100.50 a	7200 a
Tribunil*	14.06	47.37 bc	6.3 bcd	93.12 ab	6320 abc
Tribunil**	11.55 e	48.19 ab	6.13 bc	98.00 ab	6720 ab
Tribunil***	09.25 f	47.64 bc	6.19 b	98.75 a	6775 ab
Probe*	18.25 c	44.07 de	5.75 def	91.87 ab	6150 abc
Probe**	14.09 d	45.07 de	5.75 def	91.87 ab	6150 abc
Probe***	20.01 b	43.89 e	5.47 f	83.12 abc	5250 cd
Ronstar*	11.45 e	46.40 cd	5.80 cde	93.75 ab	6575 ab
Ronstar**	14.65 d	45.14 de	5.75 def	90.00 ab	6300 abc
Ronstar***	18.25 c	44.16 e	5.60 ef	78.75 bc	5825 bc

Means followed by different letters are significantly different at 1% level of significance according to DMR test.

The cost benefit ratio calculated for different weed control treatments revealed that increased benefit of Rs. 12100.00/ha over control was recorded in the hand weeded plots (Table-2). But due to high variable cost, Ronstar 12 L when applied at 1 day after transplanting gave satisfactory weed control and good yield at relatively low variable cost, found to be the most economical herbicide. Probe 75 and Ronstar when applied at 7 days after transplanting with its cost benefit ratio of 1:20.70 and 1:20.00, respectively, stand second and third most economical herbicides, Tribunil 70 WP when applied at 14 days after transplanting gave better weed control and highest bulb yield of onion, but due to its high variable cost (Rs. 600.00/ha), it gave the lowest cost benefit ratio of 1: 19.32 and 1:19.16 respectively, which is lower than the Ronstar and Probe. Similar findings were observed by Nawaz *et al* (1988) who reported that cost benefit ratio was highest in Tribunil 70 WP treated plots as compared to other herbicides. It is a normal trend of farmers looking always for economical methods. Therefore, they will naturally prefer Ronstar and Probe for use in onion, which proved effective, economical and gave highest bulb yield.

Table 2. Cost benefit ratio of different weed control treatments in onion crop

Weed Treatment	Gross Field Benefits (Rs. ha <sup>-1</sup> )	Variable Cost (Rs. ha <sup>-1</sup> )	Net Benefit (Rs. ha <sup>-1</sup> )	Increased Net Ben. over cont (Rs. ha <sup>-1</sup> )	Cost Benefit Ratio
Control	7110	--	7110	--	--
Hand Weeding	12960	860	12100	4990	1:14.07
Tribunil*	11376	600	10776	3666	1:17.96
Tribunil**	12096	600	11496	4386	1:19.16
Tribunil***	12196	600	11596	4486	1:19.32
Probe*	10170	510	9660	2550	1:18.94
Probe**	11070	510	10560	3450	1:20.70
Probe***	9450	510	8940	1830	1:17.52
Ronstar*	11836	540	11296	4186	1:20.92
Ronstar**	11340	540	10800	3690	1:20.00
Ronstar***	10486	540	9946	2836	1:18.42

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