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COMPARISON OF DIFFERENT WEED MANAGEMENT PRACTICES IN ONION (*Allium cepa* L.) UNDER AGRO-CLIMATIC CONDITIONS OF DERA ISMAIL KHAN, PAKISTAN

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ABSTRACT

Field study was conducted at Agricultural Research Institute, Ratta Kulachi, Dera Ismail Khan, Pakistan during 2007 to compare different weed management practices in onion cv. 'Shah Alam'. Randomized complete block design, having three replications was used. The treatments were; 1) Dual Gold (pre-emergence) @ 2.5 L ha^{-1}, 2) Buctril Super (post-emergence) @ 1.25 L ha^{-1}, 3) Stomp 33% (pre-emergence) @ 2.5 L ha^{-1}, 4) weeds free (manual weeding throughout the season), 5) manual weeding (30 and 60 days after transplanting) and 6) control (no weeding). Major weeds infesting the experimental field were Anagallis arvensis, Convolvulus arvensis, Lathyrus aphaca, Medicago denticulata, and Melilotus indica. Statistical analysis of the data showed that various weed control practices had significant effect on weed density and onion yield. For controlling weeds, Stomp 33% was found to be the best. Maximum bulb yield of 9.32 t ha^{-1} was found in weeds free (manual weeding throughout season) and Stomp 33% with bulb yield of 8.89 t ha^{-1}, whereas, minimum bulb yield (5.70 t ha^{-1}) was recorded in weedy check plots. Therefore, hand weeding throughout season or the use of Stomp 33% @ 2.5 L ha^{-1} are recommended for achieving higher onion yield. However, manual weeding may not be feasible and economical in the large onion cultivations.

Keywords: Onion, weed, herbicides, management.

INTRODUCTION

Onion (*Allium cepa* L.), locally known as *piaz* belongs to family Alliaceae, is a biennial herbaceous and cross-pollinated winter vegetable. Onions are available in fresh, frozen, canned and dehydrated forms. They can be used, usually chopped or sliced, in almost every type of food including cooked foods and fresh salads and as a spicy garnish. Depending on the variety, onion can be sharp and pungent or mild and sweet. Onions pickled in vinegar are eaten as a snack. They are commonly used as a base for curries or made into a

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paste and eaten as a main course or as a side dish. Onion can be successfully grown on any type of soil that is fertile and well drained. Clay, alluvial, sandy loam and muck soils are the best soil types suited for onion cultivation. A soil pH of 6.0 to 7.0 is recommended for the successful production of onion crop (Baloch, 1994).

The average yield of onion in Pakistan is very low as compared to other leading countries due to many factors. One of the main limiting factors is weed infestation. Weeds compete with onions for nutrients, soil moisture, space, and light and considerably reduce the yield, quality and value of the crop through increased production and harvesting costs (Hussain, 1983). Due to smaller leaf size and slow growth, onions cannot compete well with weeds. Weeds compete with crop plants at very early growth stages and harbor insect pests and disease-causing organisms. Losses caused by weeds have been estimated to be much higher than those caused by insect pest and diseases. Generally the yield of onion crop is reduced by 30 to 60 % due to weed infestation. Usually farmers do not do weeding early enough to prevent major damages to onion.

As weeds decrease the profitability of the onion crop, therefore weeds must be controlled well in time. The most widely used technique of modern weed control involves chemical control. Numerous research trials have indicated that many herbicides can be used effectively and selectively to control weeds in onion (Jilani *et al.*, 2003; Thakral *et al.*, 2003; Ghaffoor, 2004; Marwat *et al.*, 2005). A good weed management program is essential for good onion production. This study was therefore, conducted to compare the effectiveness of different control methods of weeds in onion crop.

MATERIALS AND METHODS

Field study was conducted to compare various weed management practices in onion *(Allium cepa* L.*)* at Agricultural Research Institute, Dera Ismail Khan, NWFP, Pakistan during winter season 2007. The experiment was laid out in Randomized Complete Block (RCB) design. Plot size was 4×3 m^2. The following six treatments, each replicated three times were included in the trial.

T1: Dual Gold (s-metolachlor) @ 2.5 L ha^{-1}.
T2: Buctril Super (bromoxinil + MCPA) @ 1.25 L ha^{-1}.
T3: Stomp 33% (pendimethalin) @ 2.5 L ha^{-1}.
T4: Weed Free (Manually weeding throughout the season)
T5: Hand Weeding (30 and 60 days after transplanting)
T6: Control (Weedy check)

Nursery bed was prepared by mixing farmyard manure and

sand in the soil. Seeds of onion local cv. 'Shah Alam' were placed in lines and slightly covered with soil. Irrigation was done with the help of sprinkler. Seed germination started within a week after sowing. Further irrigation was done as required.

Land was prepared and recommended dose (20-25 tons ha^{-1}) of FYM was incorporated into the soil. NPK were applied @ 120-60-60 kg ha^{-1} using urea, single super phosphate (SSP) and sulphate of potash (SOP), respectively. Full doses of phosphorus and potassium and half dose of nitrogen were applied before transplanting, while remaining dose of N was added one month after transplanting.

Onion seedlings at 2-3-leaf stage were transplanted to the experimental site during first week of February, 2007. Row to row and plant to plant distances were kept 30 cm and 15 cm, respectively. Stomp and Dual Gold were sprayed with the help of a Knapsack sprayer immediately after transplanting, before emergence of weeds whereas, Buctril Super was sprayed after emergence of weeds. The weeds free plots were hand weeded manually throughout the season. Hand weeding was done twice during the crop season i.e. first hand weeding was done 30 days after transplanting, while the second one was done 60 days after transplanting. Weedy check was also included for comparison. The following parameters studied during the course of experimentation included weed density (m^{-2}), fresh weed biomass (g m^{-2}), dry weeds biomass (g m^{-2}) and Bulbs yield (t ha^{-1}).

Statistical analysis

The data recorded were statistically analyzed using MSTATC Software and the means were separated by using LSD test at 5% probability level (Steel and Torrie, 1984).

RESULTS AND DISCUSSION

Weed density (m^{-2})

Statistical analysis of the data (Table^{-1}) showed that different treatments significantly ($P<0.0001$) affected weed density in onion crop. It was noted that maximum (102.7 m^{-2}) weed density was recorded in Control (weedy check). Weed density (76 m^{-2}) in plots sprayed with Buctril Super was at par with manual weeding twice during the crop season (62.33 m^{-2}). Similarly weed density in Dual Gold (30.33 m^{-2}) and Stomp (14.33 m^{-2}) was also statistically at par, but lesser among all the treatments except weeding throughout the season. The application of Stomp was in turn at par with the plot weeded throughout the growing season (Table-1). These results depicted that herbicides Dual Gold and Stomp effectively controlled weeds. Broad leaf weeds like *Convolvulus arvensis*, *Chenopodium*

album, *Medicago denticulata*, *Melilotus indica*, *Rumex dentatus*, *Anagallis arvensis* and *Euphorbia helioscopia*, sedges like *Cyperus rotundus* and grasses like *Cynodon dactylon* and *Desmostachya bipinnata* were found in onion crop during the course of study. Buctril Super controlled broad leaf weeds but did not control sedges and grasses. These results are in agreement with the findings of Zhidkov and Krivtsov (2003), Ghaffoor (2004), Manisha *et al*. (2005) and Marwat *et al.* (2005). They found that Stomp 33% effectively controlled weeds. The present study showed that although manual weeding throughout the season controlled weeds but it is too much laborious, time consuming and expensive. However, manual weeding is recommended for the farmers having small land holdings or home gardens. While in case of large fields, herbicide will definitely prove effective and economical for the weed management in onion crop.

Fresh weed biomass (g m^{-2})

Statistical analysis of the data indicated that fresh weed biomass (g m^{-2}) was also significantly ($P<0.0001$) affected by different weed management practices (Table^{-1}). It was found that hand weeding and application of herbicides reduced the fresh weed biomass. There were no weeds in the plots, where hand weeding was done throughout the crop season. Among the remaining treatments, the minimum fresh weed biomass (131 g m^{-2}) was recorded in plots sprayed with Stomp 33%, while maximum fresh weed biomass (928.7 g m^{-2}) was recorded in control, where weeds were not controlled (Table-1). These results are in agreement with the findings of Qasem (2006). He also found similar results in his study that application of herbicides and hand weeding significantly reduced weed biomass m^{-2}. Decreasing the biomass of weeds has significant impact on the crop as weed biomass is more important than density.

Dry weed biomass (g m^{-2})

Statistical analysis of the data showed that dry weed biomass (g m^{-2}) was significantly ($P<0.0001$) affected by different weed management practices (Table-1). The results depicted that hand weeding and application of herbicides reduced the dry weed biomass. There were no weeds in the plots, where hand weeding was done throughout the crop season. It was noted that minimum dry weed biomass (17.33 g m^{-2}) was recorded in plots sprayed with Stomp, while maximum dry weed biomass (121.7 g m^{-2}) was noted in control, where weeds were not controlled (Table-1). These findings are in agreement with the work of Saimbhi *et al.* (2000). They found that application of herbicides and hand weeding reduced the dry weed biomass. Similar observations were also communicated by Thakral *et al.* (2003), Manisha *et al.* (2005) and Qasem (2006). Their studies showed that application of herbicides and hand weeding resulted in the

lowest dry weed biomass. Khan *et al.* (2003) also reported that weed biomass was significantly affected by herbicidal application.

Bulb yield (t ha^{-1})

Analysis of variance indicated that bulb yield (t ha^{-1}) was significantly affected by different weed management practices (Table-1). The results depicted that highest yield (9.32 t ha^{-1}) was recorded in plots that was kept weed free throughout the growing season. Its bulb yield was 63.56 % higher than that of control plots, where weeds were allowed to grow throughout the season. It was followed by plots sprayed with Stomp 33%, which produced bulb yield of 8.89 tons ha^{-1}, showing 56.02 % increase over the bulb yield of control. However, both the treatments were statistically at par. The herbicide Dual Gold and Hand weeding twice by producing 7.66 and 7.56 tons ha-1, statistically non-significant with each other were intermediate in bulb production. The plots with no weed control gave the lowest bulb yield of only 5.7 t ha^{-1}, which was statistically at par with the yield obtained from plots treated with Buctril super. Since the Buctril super is a broadleaf herbicide, it failed to pick grasses and sedges consequently could not surpass the weedy check (Table-1). These results are in agreement with the findings of Mishra and Jyotishi (2002). They found that the highest average onion bulb yield was obtained in the plots treated with Stomp 33%. The bulb yield was 62.69 % higher than the un-weeded treatment. Similar results were also demonstrated by Jilani *et al.* (2003), Zhidkov and Krivtsov (2003), Ghaffoor (2004) and Manisha *et al.* (2005). They reported that the highest bulb yield was obtained in plots sprayed with Stomp 33%.

CONCLUSIONS AND RECOMMENDATIONS

The present findings exhibit that different weed management practices significantly reduce weed density and increase onion bulb yield with either hand weeding or the application of different herbicides. Overall, Stomp 33% proved to be the best weed control method. Results reveal that hand weeding throughout growing season had controlled all weeds, which resulted in the highest onion bulb yield, but this method is laborious and un-economical method to control weeds as compared to the application of herbicides. The use of Stomp 33% as pre-emergence to weeds is therefore, recommended in onion crop to achieve maximum yield per unit area.

Table-1. Weed density, fresh and dry weed biomass m^{-2}, and bulb yield (tons ha^{-1}) as affected by different treatments in onion.

Treatments	Weed density m^{-2}	Fresh weed biomass (g m^{-2})	Dry weed biomass (g m^{-2})	Bulb yield (tons ha^{-1})
Dual Gold (S-metolachlor) @ 2.5 L ha^{-1}	30.33 c	226.7 d	29.67 d	7.66 b
Buctril Super(bromoxynil + MCPA) @1.25 L ha^{-1}	76.00 b	674.7 b	88.33 b	6.10 c
Stomp 33% (pendimethalin) @ 2.5 L ha^{-1}	14.33 cd	131.0 e	17.33 e	8.89 a
Weeds free (manually throughout season)	0.000 d	0.000 f	0.000 f	9.32 a
Manual weeding (Twice during season)	62.33 b	507.3 c	66.67 c	7.56 b
Control (No Weeding)	102.7 a	928.7 a	121.7 a	5.70 c
$LSD_{0.05}$	17.10	86.30	11.24	0.72

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