Pak. J. Weed Sci. Res. 17(3): 277-283, 2011

IMPACT OF MANUAL WEEDING INTERVAL ON ONION (*Allium cepa* L.) YIELD AND YIELD COMPONENTS

Kalim ur Rahman[1], Habib ur Rahman[1*], Muhammad Iqbal[1], Kalim Ullah[2], Muhammad Azim Khan[3] and Muhammad Sadiq[4]

ABSTRACT

A field experiment was conducted to assess the impact of weeding interval on yield and yield components of onion (Allium cepa L.) in Horticultural Research Area, Gomal University, D.I. Khan, during winter 2010-11, Using RCB design with seven treatments viz. no weeding (control) and manual weeding at 15, 30, 45, 60, 75, and 90 days interval. Each treatment was replicated thrice. The data recorded in different plots, was compared with control plot. Onion bulb yield and related parameters (bulb diameter, bulb height and bulb weight) were significantly ($p \leq 0.01$) affected by different weeding intervals as compared to control (no weeding). The maximum bulb yield was found in plots with 15 days weeding interval whereas, minimum bulb yield was recorded in control. Similarly weed density and weed biomass (fresh and dry) were reduced significantly ($p \leq 0.01$) with decrease in weeding intervals.

Key words: *Allium cepa*, hand weeding, onion, weed competition, yield.

INTRODUCTION

Onion (*Allium cepa* L.) is one of the most important commercial vegetable crops, which is used both in raw as salad and in cooking as spices. Onion produces bulbs more rapidly in warm (21-26°C) than at cool (15-21°C) temperature. For early planting of onion, nursery is raised between July and August and transplanted from September to October. In the plain areas of Pakistan for the winter crop, nursery is raised from mid October to the end of November. In December and early January, when the seedling reach the age of 8-10 weeks, they are transplanted. The total area under onion cultivation in Pakistan was 129.529 thousand ha which has produced almost 1704.143 thousand tons of onion in 2008-09, whereas, the area under onion cultivation in Khyber Pakhtunkhwa province was 12.066 thousand ha which has produced 136.442 thousand tons onion in the year 2008-09 (MINFA, 2009). The onion production is much lower in the country

[1]Department of Horticulture, Gomal University, D.I. Khan, Pakistan.
[2]Department of Plant Breeding & Genetics, Gomal University, D.I. Khan.
[3]Department of Weed Science, Agricultural University Peshawar, Pakistan.
[4]Department of Agronomy, Gomal University, D.I. Khan, Pakistan.
*Corresponding author: habibmarwat@yahoo.com

because the crop potential is not fully utilized due to many production constraints such as high cost of different inputs (seed, fertilizer, chemicals etc), less availability of hybrid and advance varieties, and adverse competitive effect of weeds. Among all these production constraints, weeds play a major role in reducing the yield of the onion crop. Weed is a plant that does more harms than good and has a habit of encroaching where it is not desired. Weed control is an unavoidable for successful crop production. Production losses may rise mainly from the competition between crop and weeds for light, water, space and nutrients (Iqbal *et al*., 1990). Weeds also encourage other pests, insects and disease causing organisms, thus deteriorating the quality of the onion bulbs and decrease their production. Weeds increase the input and labor cost and thus reduces the net income. The losses caused by weeds have been estimated to be much higher than those caused by insect, pests and disease put together. Generally the yield of crop is reduced by 30-60% due to weeds infestation (Ghosh *et al*., 2004).

Weeds compete with the crop plants more at early stages. Usually farmers do not remove weeds early enough to prevent major damage due to this competition. Weeds can be controlled mechanically, biologically and chemically. Hand pulling and hoeing are the methods of manual weed control. Hand weeding is considered to be the best method of weeds removal in onion crop but is difficult to practice. In the presence of weeds crop establishes and grows slowly, giving the weeds, the advantage of a longer germination period. Most farmers in Khyber Pakhtunkhwa have small land holdings and cannot afford herbicides and other mechanical methods. In the light of above discussion, the present study was conducted with the objectives to assess the impact of weed removal timing intervals on weed and onion production and to find the best weeding interval for the poor farming community of the study area.

MATERIALS AND METHODS

A field experiment was conducted at Horticultural Research Area, Faculty of Agriculture, Gomal University, Dera Ismail Khan during winter 2010-11 to decode the impact of weeding interval on the onion yield and weeds. The experiment was laid out in Randomized Complete Block Design with three replications using a net plot size of 1.5 m x 1.5 m. The following treatments were applied during the course of study.

T1: Hand weeding at 15 days interval
T2: Hand weeding at 30 days interval
T3: Hand weeding at 45 days interval
T4: Hand weeding at 60 days interval
T5: Hand weeding at 75 days interval
T6: Hand weeding at 90 days interval
T7: Control (Weedy check)

Land was prepared and recommended dose (20-25 tons ha^{-1}) of farm yard manure (FYM) was incorporated into the soil. Nitrogen, Phosphorus and Potassium (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 sowing, while remaining dose of nitrogen was added to the experimental plot one month after transplanting (Baloch, 2008). Onion seedlings at 2-3 leaf stage were transplanted to the experimental plot on 20th December, 2010. Row to row and plant to plant distances were kept 30 cm and 15 cm, respectively. Plants were irrigated with river and tube well water as required.

Data collection and analysis

The parameters studied during the course of experiment were bulb diameter (cm), bulb height (cm), bulb fresh weight (g), bulb yield (t ha^{-1}), weeds fresh biomass (g m^{-2}), weeds dry biomass (g m^{-2}), and weed density. For recording fresh weed biomass, the weeds in individual plots were removed at the crop maturity/harvested stage, whereas, for dry weeds biomass, weeds were kept in electric oven (set at 70°C) for 72 hours and then dry biomass was recorded with sartorius balance. All the data recorded were statistically analyzed using MSTATC software. The purpose of analysis of variance was to determine the significant effect of treatments on weeds and onion. LSD test was applied when analysis of variance showed significant effects for treatments (Steel and Torrie, 1984).

RESULTS AND DISCUSSION

Crop growth parameters

The analysis of variance of bulb diameter depicts that bulb diameter was highly significantly ($p \leq 0.01$) affected by different weeding intervals (Table-1). The mean values are presented in Table-2. The highest bulb diameter (7.20 cm) was obtained in plots, where weeds were uprooted with 15 days interval, while lowest bulb diameter (3.40 cm) was obtained in control plots, where no weeding was done at all. Thus, the data showed a decrease in diameter with increase in weeding intervals (Table-2). Similarly, with an increase in weeding interval, bulb height decreased. Maximum bulb height of 5.90 cm was obtained in plots at 15 days weeding interval, followed by 30 days weeding interval (4.50 cm), while minimum bulb height (2.50 cm) was obtained in plots, where no weeding was done throughout the crop season. Bulb fresh weight was also significantly ($p \leq 0.01$) influenced by different weeding intervals (Table-1). The mean values of bulb fresh weight (Table-2) clearly depicted that maximum bulb fresh weight (135.4 g) was obtained in plots where weeding was done after every 15 days while minimum bulb fresh weight (65.75 g) was

obtained in control where no weeding was done throughout the crop season. Table-2 also explains that bulb fresh weight gradually decreased with increase in weeding intervals. Bulb yield was also highly significantly ($p \leq 0.01$) influenced by different weeding intervals (Table-1). Table-2 demonstrates that with an increase with weeding intervals, bulb yield progressively decreased. The plot in which weeding was performed every 15 days, showed maximum bulb yield (18.05 t ha^{-1}) while minimum bulb yield (8.77 t ha^{-1}) was obtained in control treatments, where weeds were allowed to compete with the crop throughout the crop season. Similar results were also obtained by other researchers in their crop-weed competition studies. Ghosh *et al*., 2004; Gorad *et al*., 2004; Marwat *et al*., 2005; Zubair *et al*., 2009 also found the highest onion bulb diameter, bulb height, bulb weight and yield in plots, where weeds were either controlled manually or chemically. In similar studies, Rahman *et al*., 2011 also found the highest bulb diameter, bulb height, bulb weight and bulb yield in garlic crop. The canopy of onion crop is very small to facilitate weeding at early growth stages for getting higher marketable bulb yield. Therefore, an early weed control in onion provides opportunity to the crop plants to grow faster and utilize the available resources, which otherwise are used by the weeds.

Weed parameters

Statistical analysis of the data showed that different weeding intervals highly significantly ($P \leq 0.01$) affected the weed density m^{-2} in onion crop. It was noted that maximum weed density was recorded in control (696.30 m^{-2}) where no weeding was done throughout the crop season, while minimum weed density (56.74 m^{-2}) was recorded in plots where weeding was done with 15 days interval (Table-2). Fresh weed biomass (g m^{-2}) was highly significantly ($P<0.01$) affected by different weeding intervals. It was found in the present study that manual weeding with different intervals reduced the fresh weed biomass significantly (Table-1). Minimum fresh weed biomass (29.18 g m^{-2}) was recorded in plots, where weeding was performed with 15 days interval, while maximum fresh weed biomass (356.8 g m^{-2}) was noted in plots, where weeds were not controlled. Dry weed biomass (g m^{-2}) was also highly significantly ($P<0.01$) affected by different weeding intervals (Table-1). Minimum dry weed biomass (9.98 g m^{-2}) was recorded in plots, where weeding with 15 days interval was performed, while maximum dry weed biomass (71.21 g m^{-2}) was noted in plots, where weeds were not controlled. Several researchers also reported highest weed control with manual weeding throughout the crop season (Ghosh *et al.* (2004) and Gorad *et al.* (2004), Manisha *et al.* (2005), Marwat *et al.* (2005), Ghadage *et al.* (2006), and Zubair *et al*. (2009).

Table-1. Mean squares (MS) for the parameters as affected by different manual weeding intervals in onion.

Source	DF	Bulb diameter (cm)	Bulb height (cm)	Bulb fresh weight (g)	Bulb yield (t ha^{-1})	Weed density m^{-2}	Weed fresh biomass (g m^{-2})	Weed dry biomass (g m^{-2})
Replication	2	0.007	0.004	3.624	0.063	162.538	480.895	2.143
Treatments	6	5.581**	3.966**	1598.779**	28.409**	156066.441**	38102.757**	1396.613**
Error	12	0.036	0.013	9.101	0.164	2292.211	695.149	8.375
CV %		3.9	3	3.17	3.19	14.37	15.41	7.95

**= highly significant at 0.01 level of probability.

Table-2. Average bulb diameter, height, weight, yield (t ha^{-1}), weeds density, fresh and dry weed biomass as affected by different manual weeding intervals in onion.

Weeding interval	Bulb diameter (cm)	Bulb height (cm)	Bulb fresh weight (g)	Bulb yield (t ha^{-1})	Weed density m^{-2}	Weeds fresh weight (g m^{-2})	Weeds dry weight (g m^{-2})
Control	3.40 D	2.50 G	65.75 F	8.77 F	696.3 A	356.8 A	71.21 A
90 days	3.50 D	2.90 F	75.13 E	10.02 E	552.4 B	267.2 B	57.07 B
75 days	4.00 CD	3.20 E	84.54 D	11.27 D	383.5 C	194.6 C	42.26 C
60 days	4.80 BC	3.70 D	96.14 C	12.82 C	296 D	147.4 D	27.43 D
45 days	5.20 B	4.10 C	102.6 B	13.68 B	196.7 E	127.9 D	25.46 DE
30 days	5.80 B	4.50 B	107.1 B	14.28 B	150.9 E	74.41 E	21.51 E
15 days	7.20 A	5.90 A	135.4 A	18.05 A	56.74 F	29.18 F	9.98 F
LSD	1.067	0.1862	4.926	0.6612	78.17	43.05	4.725

Means not sharing common letters are statistically different at 1% level of probability.

CONCLUSIONS

It is concluded from the study that weeds density, fresh and dry weed biomass were convincingly decreased with decrease in manual weeding interval, resulting in increased onion yield (t ha^{-1}) due to significant increase in the attributing components (bulb diameter, bulb height and bulb weight). In spite of the fact that manual weeding is a tedious, laborious and time consuming job; maximum crop yield can be achieved with frequent manual weeding intervals through out the crop season. The area under study is backward area of the province and labor is easily available and cheaper, therefore hand weeding is the best option for the farmers having small land holdings. Although the cost of labor will increase the cost of production but usually the whole families of the farmers are involved in farming, therefore manual weeding in a small area is possible and economical as well. However, rainfall during the winter months may hamper the manual weeding due to which the farmers will have the only option of chemical weed control. Keeping in view the small area under onion, weeding is possible, economical and environment friendly in the area under study for the farmers.

REFERENCES CITED

Baloch, A.F. 2008. Vegetable crops in Horticulture. Edited by M.N. Malik. Bioteck Books, Delhi. Pp. 500-502.

Ghadage, H.L., J.V, Kathepuri, V.Y. Sankpal and S.M. Jawale. 2006. Integrated weed management in winter onion (*Allium cepa* L.) under irrigated conditions. Res. Crops 7(1): 275-278.

Ghosh, R.K., S. Sankar, G. Pritam and S.K. Ghosh. 2004. Integrated weed management in onion (*Allium cepa* L.) under entisol of West Bengal. Ind. Agric. 48(3-4): 233-236.

Gorad, M.K., P.B. Ghode, D.T. Deshmukh and D. Megha. 2004. Effect of pre-emergence herbicides on weed control and yield of onion. Annals Plant Physiol. 18(2): 146-148.

Iqbal, J.S., S.M. Ramzan and M. Shafi. 1990. Chemical weed control in onion. J. Agric. Res. 28(1): 23-28.

Manisha, K., P. Shubhi and K. Shailendra. 2005. Integrated weeds management in Kharif onion (*Allium cepa* L.). Farm Sci. J. 14 (2): 89-90.

Marwat, K.B., B. Gul, M. Saeed and Z. Hussain. 2005. Efficacy of different herbicides for controlling weeds in onion in higher altitudes. Pak. J. Weed. Sci. Res. 11(1-2): 61-68.

MINFA. 2009. Ministry of food and agriculture (economic wing), Islamabad, Govt. of Pakistan.

Rahman, H.U., K. Ullah, M. Sadiq, H.U. Khan, M.A. Khan and A.M. Khattak. 2011. Impact of time of weed removal on garlic (*Allium sativum* L.) yield. Pak. J. Weed. Sci. Res. 17(2): 151-159.

Steel, R.G.D. and J.H. Torrie. 1984. Principles and Procedure of Statistics. Mc-Graw Hill Book Co. Inc. New York.

Zubair, M., H.U. Rahman and M.S. Jilani. 2009. Comparison of different weed management practices in onion (*Allium cepa* L.) under agro-climatic conditions of Dera Ismail Khan. Pak. J. Weed Sci. Res. 15(1): 45-51.