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Weed management in onion

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ABSTRACT

The experiment involved nine treatments replicated thrice in randomized block design. Significantly lower density and dry matter of weeds were recorded with weed free followed by oxyflurofen 0.30 kg/ha before planting *fb* one hand weeding of 40-60 DATS after transplanting and combined application of oxyflurofen at 0.30 kg/ha before planting + quizalofop-p-ethyl 0.05 kg/ha at 30 days after transplanting. The average bulb weight, plant height, marketable bulb and total bulb yield were also highest in weed free while it was at par to oxyflurofen at 0.30 kg/ha before planting *fb* one hand weeding of 40-60 days after transplanting and oxyflurofen at 0.30 kg/ha + quizalofop-p-ethyl 0.05 kg/ha at before planting and 30 days after transplanting. The maximum B: C ratio of 2.31 was obtained in combined spray of oxyflorfen and quizalofop-p-ethyl at before planting and 30 days after transplanting of crop.

Key words: *Allium cepa*, Onion, Oxyflurofen, Pendimethalin, Quizalofop-p-ethyl

Onion (*Allium cepa* L.) belonging to the family Alliaceae is one of the important bulbous vegetable crop of economic importance and widely cultivated all over the world, with particular distribution in the Asian continent and in Europe. It is mainly used for cuisine and culinary purpose and also preventing coronary heart diseases and other aliments (Sangha and Bariag 2003). Due to its poor competitive ability with its slow initial growth and lack of adequate foliage makes onion weak against weeds. In addition, their cylindrical upright leaves do not shade the soil to block weed growth. Un-controlled weed growth reduces the bulb yield up to 40-80% depending upon the nature of intensity and duration of weed competition in onion field. Hand weeding is a common method of weed control adopted by farmers but comparatively this method is costly and time consuming. Thus use of herbicides is one of the options left with the farmers to eliminate crop weed competition at early growth stage of crop. Therefore, this study was conducted to compare the effectiveness of different control methods of weeds in onion crop.

MATERIALS AND METHODS

Field experiment was conducted to compare various weed management practices in onion at Tirhut College of Agriculture, Dholi, Muzafferpur during consecutive three *Rabi* season from year 2009 to 2012. The soil of experimental site was sandy loam in texture, alkaline in reaction (pH:8.51), low in available N (219 kg/ha), available P (14.63 kg/ha), available K (109 kg/ha) and low in organic carbon content (0.43).The experiment with nine treatments was laid out in randomized block design in three replications (Table 1). Onion var. '*Agrifound light red*' (52 days old seedling) was transplanted at a spacing of 20 x 10 cm apart on December 14, 17 and 19 during 2009, 2010 and 2011, respectively. Well decomposed FYM 10 t/ha was applied uniformly at the time of field preparation and crop was fertilized with 100:80:80 kg NPK/ha. All the herbicides were applied at standard time of their application by using a Maruti foot sprayer fitted with flat fan nozzle with spray volume of 700 liter water/ha. Observations on density of weeds and their dry weight were taken at 90 DAT stage of onion crop. The crop was harvested on April 28, May 01 and May 02 in the year 2010, 2011 and 2012, respectively. The bulbs were harvested from net plot and yield was recorded after grading. The data on density and dry weight of grassy weeds were subjected to square root transformation *i.e.* $\sqrt{x+0.5}$ prior to statistical analysis.

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RESULTS AND DISCUSSION

Effect on weeds

The field were infested with *Phalaris minor* among grasses, *Chenopodium album, Melilotus alba, M. indica, Parthenium hysterophorus, Anagallis arvensis, Physalis minima* among broad-leaved weeds and *Cyperus rotundus* in sedges during all the years.

All the weed control treatments resulted significant reduction in total weed density and dry matter accumulation in comparison to weedy check (Table 1). Oxyfluorfen 0.30 kg/ha *fb* one hand weeding, oxyfluorfen 0.30 kg + quizalofop-p-ethyl 0.05 kg/ha, pendimethalin + quizalofop-p-ethyl (1.0 + 0.05 kg/ha) and oxyfluorfen 0.30 kg/ha *fb* quizalofop-p-ethyl 0.05 kg/ha were statistically at par with each other in reducing weed density at 90 DAT. The similar trends were also found in total weed dry matter except oxyfluorfen at 0.30 kg/ha *fb* quizalofop-p-ethyl 0.05 kg/ha, which recorded significantly higher weed biomass than others. These findings were in confirmation with Kumar and Mourya (2006) and Kumar *et al.* (2014). The result on weed control efficiency (WCE) showed variability among different weed management schedules in onion. The WCE of different herbicide treatment varied from 39% (pendimethalin alone) to 57.4% (oxyflorfen *fb* one hand weeding). Maximum WCE was recorded in weed free followed by oxyflorfen *fb* one hand weeding at 40-60 DAT (57.5%) and oxyfluorfen + quizalofop-p-ethyl (56.1%). Low weed index in oxyflorfen *fb* one hand weeding at 40-60 DAT and oxyfluorfen + quizalofop-p-ethyl indicated that competition due to weeds was lowest in these treatments as compared to others. Similar results were also reported by Sinare *et al.* (2014).

Effect on crop

The vegetative growth and yield contributing character were varied significantly owing to different weed control treatments (Table 2). The significantly highest plant height (60.27 cm) and average weight of bulb (70.54 g) was obtained with weed free and it was non-comparable to oxyflorfen *fb* one hand weeding at 40-60 DAT but statistically superior to all other treatments. The average bulb weight in onion varied from 49.99 g (weedy check) to 70.54 g (weed free) with a mean value of 60.89 g. Among the herbicide, heaviest bulb weight (68.76 g) was recorded in oxyflorfen *fb* one HW at 45 DAT, which was also at par to oxyflurofen + quizalofop-p-ethyl. The highest no. of leaves was also recorded in oxyflorfen + quizalofop-p-ethyl, which was similar to other weed control treatments except alone treatments of oxyflorfen and pendimethalin. The variability in growth and yield parameter are due to effectiveness of weed control methods which ultimately increased the nutrient availability for the crop (Marwat *et al.* 2003).

Weeds in weedy check reduced the onion total bulb yield by 32.7% over weed free (Table 2). Among the weed control treatments, weed free recorded the highest marketable bulb yield (35.65 t/ ha), which was statistically similar to oxyflourfen + one hand weeding (36.20 t/ha) and oxyfluorfen + quizalofop -p-ethyl, but significantly differed from all other treatment. The trend was also same with total bulb yield of onion. The findings was in close proximation to Dudi *et al.* (2011) and Chattopadhyay *et al.* (2011). Follow up application of oxyfluorfen and pendimethalin with quizalofop-p-ethyl resulted increase in marketable and total bulb yield of onion than its alone application at before planting and 30 DAT but all these were at par to each other. Weed dry matter also showed negatively correlated with marketable and total bulb yield (r = -0.88 and r= -0.90) and accounted for 77 and 80% variation, respectively due to different weed control

Table1. Effect of different weed control treatments on weed density, weed dry matter, weed control efficiency and weed index in onion (pool data of three year)

Treatment	Total weed density (no./m^2)	Total weed dry matter (g/m^2)	Weed control efficiency (%)	Weed index (%)
Oxyflurofen 0.30 kg/ha before planting and 30 DAT	5.75 (32.6)	9.08 (82.3)	41.2	28.1
Oxyflurofen *fb* quizalofop-p-ethyl 0.30 *fb* 0.05 kg/ha before planting and 30 DAT	5.54 (30.3)	8.93 (79.3)	43.3	18.2
Oxyflurofen + quizalofop-p-ethyl 0.30+0.05 kg/ha at planting and 30 DAT	4.95 (24.0)	7.85 (61.4)	56.1	9.4
Pendimethalin 1.0 kg/ha before planting and 30 DAT	5.73 (32.3)	9.24 (85.3)	39.0	28.0
Pendimethalin *fb* quizalofop-p-ethyl 1.0 *fb* 0.05 kg/ha before planting and 30 DAT	5.60 (30.8)	8.99 (80.4)	42.6	18.8
Pendimethalin + quizalofop-p-ethyl 1.0 + 0.05 kg/ha at planting and 30 DAT	5.45 (28.9)	8.64 (74.2)	47.0	14.4
Recommended practices (oxyflurofen *fb* one hand weeding) 0.30 kg/ha before planting and 40-60 DAT	4.87 (23.3)	7.70 (59.5)	57.5	6.6
Weed free	0.0 (0.0)	0.0 (0.0)	100.0	0.0
Weedy check	7.79 (60.6)	11.84(139.9)	0.0	32.7
LSD (P=0.05)	0.69	0.98	-	-

Figure given in parentheses indicate actual values, *fb*= followed by

Table 2. Effect of weed management practices on vegetative growth, average weight and bulb yield of onion (pool data of three year)

Treatment	Plant height (cm)	Number of leaves	Average weight of bulb (g)	Marketable bulb yield (t/ha)	Total bulb yield (t/ha)	B:C ratio
Oxyflurofen 0.30 kg/ha before planting and 30 DAT	54.4	6.2	54.2	25.97	26.02	2.03
Oxyflurofen *fb* quizalofop-p-ethyl 0.30 *fb* 0.05 kg/ha before planting and 30 DAT	54.5	7.0	60.0	28.34	29.60	2.20
Oxyflurofen + quizalofop-p-ethyl (0.30 + 0.05) kg/ha at planting and 30 DAT	56.7	8.7	65.7	32.12	32.80	2.31
Pendimethalin 1.0 kg/ha before planting and 30 DAT	51.3	6.9	55.5	25.04	26.05	1.99
Pendimethalin *fb* quizalofop-p-ethyl (1.0 *fb* 0.05) kg/ha before planting and 30 DAT	53.5	8.3	59.4	28.51	29.38	2.10
Pendimethalin + quizalofop-p-ethyl 1.0 + 0.05 kg/ha at planting and 30 DAT	55.2	7.2	64.9	30.19	30.98	2.24
DOGR Recommended practices (oxyflurofen *fb* one hand weeding) 0.30 kg/ha before planting and 40-60 DAT	58.5	7.3	68.8	32.83	33.80	2.30
Weed free	60.3	7.8	70.5	35.65	36.20	2.29
Weedy check	47.4	5.1	50.0	23.48	24.35	1.27
LSD (P=0.05)	3.4	1.6	3.1	3.97	3.68	-

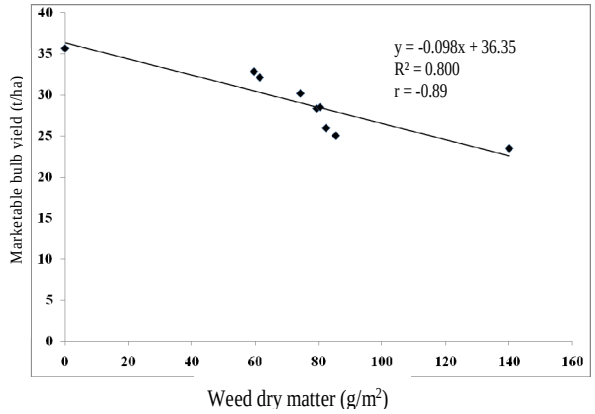

Fig. 1. Correlation between marketable bulb yield and weed dry matter

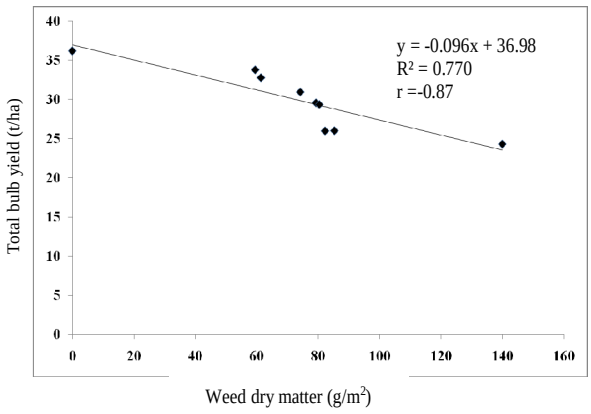

Fig. 2. Correlation between total bulb yield and weed dry matter

treatments (Fig. 1 and 2). The B:C ratio estimated in different weed management practices indicated that maximum B:C ratio of 2.31 in oxyflorfen + quizalofop-p-ethyl which was very close to oxyflorfen *fb* one hand weeding at 40-60 DAT (2.30) and weed free (2.29).

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