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Weed management studies in kharif onion (*Allium cepa* L.) on yield attributes

Pashyanti Urraiya and Madan Kumar Jha

Abstract
The present investigation entitled "Weed management studies in kharif Onion (*Allium cepa* L.)" was conducted at Horticulture Complex, Dept. of Horticulture, Maharajpur, Jawaharlal Nehru Krishi Vishwa vidyalaya, Jabalpur (M.P.) during the year 2016-17. The treatments consisted of Ten combination of different agro input management practices viz., Oxyflurofen 23.5% EC + one hand weeding at 40-60 DAT (T_1), Oxyflurofen 23.5% EC + one hand weeding at 30 DAT + Quizalofop Ethyl 5% EC at 60 DAT (T_2), Pendimethalin 30% EC + one hand weeding at 30 DAT + Quizalofop Ethyl 5% EC at 60 DAT (T_3), Black Plastic Mulch (T_4), Organic Mulch- 6 t/ha (T_5), Weedy check (T_6), Silver Plastic Mulch (T_7), Organic Mulch- 9 t/ha (T_8), Organic Mulch- 12 t/ha (T_9), Weed free check (T_{10}), Significantly maximum 260.31 q/ha and 267.31q/ha marketable and total yield respectively was recorded under the treatment T_4. Whereas, the lowest 140.02 q/ha and 147.36 q/ha yield was observed in T_6. And minimum weed index was observed (-7.36%) in the treatment T_4. The highest bolters percentage (2.70%) was recorded in the treatment T_6. The highest (3.78%) value of doubles was recorded in the treatment T_6. and the lowest doubles percentage 1.09% was recorded under the T_{10}.

Keywords: Oxyflurofen, Quizalofop Ethyl, Pendimethalin and Onion.

1. Introduction
Onion (*Allium cepa*L., 2n = 16) is one of the most important bulb crop grown all over the world. It belongs to the family Alliaceae and considered to be originated in Central Asia. It is an indispensable item in every kitchen used as salad, culinary purpose for flavoring as spices in pickles, sauce and vegetable. In India, it is being cultivated as annual crop for bulb production and as biennial crop for seed production. It is a naturally packaged vegetable consisting of fleshy, concentric scales which are enclosed in paper-like wrapping leaves, connected at the base by a flattened stem disc.

India ranks first in area and second in production of onion with about 19.9% share after China in the world. The average productivity of India is 16.3 MT/ha, which is low as compared to other onion producing countries of the world. It is cultivated in an area of 1320.13 thousand ha with a production of onion 20931.25 thousand MT out of which Maharashtra is the leading state and covers an area of 522 thousand ha with a production of 6529 thousand MT followed by Madhya Pradesh, Karnataka, Rajasthan and Gujarat . In Madhya Pradesh, it is grown in about 118 thousand ha with a production 2848 thousand MT. (NHRDF Database 2015-16).

The average productivity of India is 16.3 MT/ha, which is low as compared to other onion producing countries of the world. There are several factors which influence the production of onion. Standardization of agro techniques particularly nutrient management is one of the main constraints. Among the macro and micronutrients, nitrogen, phosphorus, potassium and sulphur are pre-requisite. Onion responded to nitrogen and sulphur positively in terms of yield and quality of bulbs (Nasreen *et al*., 2007) [2].

Herbicides play an important role in weed management in onion. Early season weed competition significantly reduces onion bulb yield. Most weed seeds germinate over a long time and pre-emergence herbicides with their relatively short residual life, may not control weeds long enough to optimize onion yield. The post emergence herbicides may be needed along with other control measures. Chemical weed control is regarded to be better than hand weeding due to drudgery of involved in weeding and unavailability of labour at peak period of weed infestation. In this aspect, application of new and wide spectrum herbicide alone or in combination may give satisfactory weed control. In Madhya Pradesh, onion is adversely affected mostly by weeds. The weeds grow in all the places of onion fields. Dominant weed species associated with onion are *Cyperus rotundas, Cynodon dactylon, Dinebraretro flexa, Digeraarvensis, Boerhaviadiffusa. Parthenium hysterophorus, Chenopodium album, Medicago denticulate and Rumaxdentatus.*

Material and Methods

Total bulb yield (kg/plot): The crop was harvested and bulbs of each plot were weighted in kilograms**.** Total yield of bulb (kg) per plot was converted in quintal per hectare by multiplying with factor.

Weed index: Weed competition index indicates the decrease or increase in yield of weeded and treated plots affected by the crop weed competition and is calculated by the formula as suggested by Gill and Kumar (1966).

$$\text{Weed index} = \frac{X-Y}{X} \times 100$$

Where,
X= Yield of weeded check, Y= yield of treatment

Results and Discussion

Yield Parameters

Various treatments of herbicides and hand weeding showed significant variation in yield and its contributing traits.

1. Marketable Yield and Total Yield (Q/Ha).

The data for various treatments with respect to yield (q/ha) are summarized in Table 1. The analysis of variance is presented.
Yield was significantly influenced by various treatments. Significantly maximum 260.31 q/ha and 267.31q/ha marketable and total yield respectively was recorded under the treatment T_4 (black plastic mulch) which were followed by T_{10} (weed free check) (242.46 q/ha and 249.13 q/ha) and T_7 (silver plastic mulch) (235.95 q/ha and 245.62q/ha) which were at par with each other. Whereas, the lowest 140.02 q/ha and 147.36 q/ha yield was observed in T_6 (weedy check).
The results also showed that treatment effect were significant in case of marketable and total bulb yield in onion. Significantly the highest marketable and total bulb yield was recorded in T_4 (260.31 and 267.31 q/ha respectively) than rest of the treatments. However, statistical parity was observed for marketable and total bulb yield in T_{10} (242.46 and 249.13 q/hq respectively) only. The results clearly indicated that along with the effects of weeds the soil properties played a major role in production of bulbs as obtained by Lalitha *et al*. (2010), Faradonbeh *et al*. (2013) and yield is more in plastic over bare ground as seen by Vavrina and Roka (2000), Job *et al*. (2016). On the other hand, significantly the lowest marketable and total bulb yield of 140.02 and 147.36 q/ha respectively was recorded in T_6 weedy check. It indicates the increase yield over weedy check because of reduced the weed population without causing severe injury to the crop and reduction in competition stress Coolong (2012).
Yield in both plastic mulch treatments was superior followed by the weedicide treatment T_2 (Oxyflurofen 23.5% EC + one hand weeding at 30 DAT + Quizalofop Ethyl 5% EC at 60 DAT). This is probably due to better plant growth which is governed by soil temperatures, soil moisture retention, suppression of weed growth, improved soil structure, well developed root system. These results were obtained by Bharadwaj *et al*. (2012).

Table 1: Marketable, total bulb yield (q/ha) and weed index (%) as affected by different treatments.

Treat. Symb.	Treatments	Dose	Marketable bulb yield (q/ha)	Total bulb yield (q/ha)	Weed index (%)
T1	Oxyflurofen 23.5% EC + one hand weeding at 40-60 DAT	150g a.i./ha	226.19	232.19	6.71
T2	Oxyflurofen 23.5% EC + one hand weeding at 30 DAT + Quizalofop Ethyl 5% EC at 60 DAT	150g a.i./ha + 50g a.i./ha	233.35	241.68	3.76
T3	Pendimethalin 30% EC + one hand weeding at 30 DAT + Quizalofop Ethyl 5% EC at 60 DAT	750g a.i./ha + 50g a.i./ha	220.96	231.29	8.87
T4	Black plastic mulch	-	260.31	267.31	-7.36
T5	Organic mulch- 6 t/ha	-	203.85	213.18	15.92
T6	Weedy check	-	140.02	147.36	42.25
T7	Silver plastic mulch	-	235.95	245.62	2.68
T8	Organic mulch- 9 t/ha	-	217.75	224.41	10.17
T9	Organic mulch- 12 t/ha	-	219.79	225.46	9.35
T10	Weed free check	-	242.46	249.13	0.00
	S.Em±	-	2.07	2.70	-
	C.D.5% level	-	6.15	8.05	-

2. Weed Index

The weed index was worked out in various treatments and is given in Table 1. It is evident from the table that minimum weed index was observed in the treatment T_4 (black plastic mulch) (-7.36%) which were followed by T_{10} (weed free check) (0%), T_7 (silver plastic mulch) (2.68%) and T_2 (Oxyflurofen 23.5% EC + one hand weeding at 30 DAT + Quizalofop Ethyl 5% EC at 60 DAT) (3.67%).
The Weed index also indicates that the yield reduction caused would be due to competition of major weeds under weedy check. The maximum reduction in weeds and increase in yield was noted in black plastic mulch. The findings are in close proximity to that of Ghosh *et al*. (2004), Bhutia *et al.* (2005), Qasem (2006) and Hussain *et al*. (2008), Waiganjo *et al*. (2009).

3. Bolters and Doubles (%)

The data for various treatments with respect to bolters and doubles (%) are summarized in Table 2.

Table 2: Bolters and double (%) as affected by different treatments

Treat. Symb.	Treatments	Dose	Bolters (%)	Double (%)
T1	Oxyflurofen 23.5% EC + one hand weeding at 40-60 DAT	150g a.i./ha	1.42	2.58
T2	Oxyflurofen 23.5% EC + one hand weeding at 30 DAT + Quizalofop Ethyl 5% EC at 60 DAT	150g a.i./ha + 50g a.i./ha	1.23	1.65
T3	Pendimethalin 30% EC + one hand weeding at 30 DAT + Quizalofop Ethyl 5% EC at 60 DAT	750g a.i./ha + 50g a.i./ha	1.57	2.70
T4	Black Plastic Mulch	-	0.00	1.26
T5	Organic Mulch- 6 t/ha	-	2.08	3.76
T6	Weedy check	-	2.70	3.78
T7	Silver Plastic Mulch	-	0.53	1.62
T8	Organic Mulch- 9 t/ha	-	1.89	3.64
T9	Organic Mulch- 12 t/ha	-	1.80	3.07
T10	Weed free check	-	0.00	1.09
	S.Em±	-	1.33	1.49
	C.D.5% level	-	N.S.	N.S.

In the treatment T_{10} (weed free check) and T4 (black plastic mulch) no bolters were found, followed by T_7 (silver plastic mulch) (0.53%) and T_2 (Oxyflurofen 23.5% EC + one hand weeding at 30 DAT + Quizalofop Ethyl 5% EC at 60 DAT) (1.23%). However, the highest bolters percentage (2.70%) was recorded in the treatment T_6 (weedy check).

The lowest doubles percentage 1.09% was recorded under the T_{10} (weed free check), which were followed by T_4 (black plastic mulch) (1.26%), T_7 (silver plastic mulch) (1.62%) and T_2 (Oxyflurofen 23.5% EC + one hand weeding at 30 DAT + Quizalofop Ethyl 5% EC at 60 DAT) (1.65%). However, the highest (3.78%) value of doubles was recorded in the treatment T_6 (weedy check).

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