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Effect of different weed management practices on growth attributes of onion (*Allium cepa* L.)

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Abstract

The field experiment was conducted during *Rabi* season of 2016-17 at the Horticulture Research cum Instructional farm, BTC CARS, Bilaspur (C.G.). The treatments consisted of ten combination of different agro input management practices viz., T₁ (control weedy check), T₂ (weed free), T₃ (Pendimethalin @ 1.75 kg/ha (pre-emergence)), T₄ (Oxyfluorfen @ 1 kg/ha (pre-emergence)), T₅ (Quizalofop-ethyl @ 1 kg/ha (Post-emergence)), T₆ (Pendimethalin @ 1.750 kg/ha (Pre emergence) + Quizalofop-ethyl @ 1 kg/ha (Post-emergence)), T₇ (Oxyfluorfen @ 1 kg/ha (Pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (Post-emergence)), T₈ (Two hand weeding at 25 and 45 DAT), T₉ (Black polythene mulch), T₁₀ (Organic mulch with paddy straw @ 20 q/ha). The significantly maximum plant height (cm) was recorded 34.44 cm (T₂), 65.89 cm (T₂), 68.58 cm (T₂), and 67.38 cm (T₂) and minimum plant height (cm) was recorded 26.33 cm (T₁), 50.80 cm (T₁), 51.71 cm (T₁), and 50.70 cm (T₁) Was recorded 30, 60, 90 DAT and at harvest. The significantly maximum number of leaves was recorded 5.60 (T₇), 8.30 (T₂), 10.00 (T₂), and 9.80 (T₂) and minimum number of leaves was recorded 4.67 (T₁), 5.47 (T₁), 6.48 (T₂), and 6.13 (T₂) Was recorded 30, 60, 90 DAT and at harvest.

Keywords: pendimethalin, oxyfluorfen, quizalofop-ethyl, and onion

Introduction

Onion (*Allium cepa* L.) is one of the most important commercial vegetable crops grown all over the world. It is native of Central Asia and Mediterranean region. It belongs to family Alliaceae and the plant is either biennial or perennial. The stem is erect and an umbel-like inflorescence composed of white or greenish-white small flowers grow at the tip of the stem. The edible bulb is composed of several overlapping layers on a central core. It is popularly known as "Queen of kitchen" because of its characteristic flavour and taste of food. Recent research has suggested that onion in the diet may play a part in preventing heart diseases and other ailments (Sangha and Baring, 2003) [10].

Onion bulb is rich in phosphorus, calcium and carbohydrates. It contains carbohydrates (11.0g), proteins (1.2g), fibre (0.6 g), moisture (86.8 g) and several vitamins like vitamin A (0.012 mg), vitamin C (11 mg), thiamine (0.08 mg), riboflavin (0.01 mg) and niacin (0.2 mg) and also some minerals like phosphorus (39 mg), calcium (27 mg), sodium (1.0 mg), iron (0.7 mg) and potassium (157 mg) (Rahman *et al.*, 2012).

Maharashtra is the leading producer of onion in India and other major onion growing states in our country are Gujarat, Karnataka, Orissa, Uttar Pradesh, Andhra Pradesh, Tamil Nadu and Rajasthan, whereas productivity is highest in Gujarat which productivity is 25.43 t/ha. (Anonymous, 2014-2015) [1]. In Chhattisgarh, it is being grown on an area of 20.06('000 ha) with a production of 308.10('000) mt and the productivity is 15.36 ton/ha (NHRDF, Nashik). The maximum cultivated area and production of onion is Mahasamund followed by Durg, Kanker, and Raipur district (Anon, 2013) [2].

Weed infestation is the important constraint in onion production, which causes reduction in bulb and seed yield to the tune of 40 to 80% (Channapagoudar and Biradar, 2007) [4]. Weeds interfere with development of bulbs and also add cost of cultivation. Weed competition reduced the bulb yield of onion to the extent of 2.35 – 61.8 per cent depending upon the duration of crop weed competition and intensity (Sankar and Lawande, 2011) [11].

In Chhattisgarh, 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 rotundus*, *Cynodon dactylon*, *Echinochloa crusgali*, *Alternanthe ratriandra*, *Amranthus viridis*, *Parthenium hysterophorus*, *Physalis minima*, *Medicago denticulata*, and *Portulaca oleraceae*. These are mostly associated with onion fields and are responsible for the low yields of onion since these weeds occur easily and grow in all parts of the state.

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Material and Method

1. Plant height at 30, 60, 90 DAT and at harvest

Five randomly selected plants from each plot were tagged for recording of observations. Plant heights from ground level up to the top of the tallest leaf were measured at 30 days intervals after transplanting.

2. Number of leaves/plant at 30, 60, 90 DAT and at harvest

Number of green leaves (functional leaves) of each tagged plants were counted at 30 days intervals after transplanting.

Result and Discussions

1. Plant height at 30, 60, 90 DAT and at harvest

The data represented to plant height of onion under various treatments at different growth stages are presented in 1.

In general, plant height increased with the advancement of growth stages and was found to be maximum 90 DAT. Growth in terms of height of the onion plant was slow initially up to 30 days; thereafter, rapid growth was recorded up to 60 DAT. However, plant height reduced up to maturity, but at slow rate.

At 30 DAT, it is evident from the data that the plant height varied significantly in response to different weed management treatments. It ranged from 26.33 cm to 34.44 cm. The maximum plant height (34.44 cm) was recorded in weed free (T₂) plot. The treatments T₂ and T₇ were found significantly superior over T₅ (Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (28.33cm) and T₁(Control weedy check)(26.33 cm) in respect to plant height at 30 DAT and others were at par.

At 60 DAT the plant height ranged from (50.80 cm to 65.89 cm),the treatment T₂ (Weed free) was significantly higher (65.89 cm) with ascompared to remaining treatments, but it was at par withT₇ (Oxyfluorfen @ 1 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (63.73 cm), however the treatmentT₈(Two hand weeding at 25 and 45 DAT) (58.66 cm),T₃ (Pendimethalin @ 1.75 kg/ha (pre-emergence)) (56.83), T₄(Oxyfluorfen @ 1 kg/ha (pre-emergence)) (56.80 cm), T₅ (Quizalofop-ethyl @1 kg/ha (post-emergence))(55.30 cm) and T₉(Black polythene mulch) (55.30 cm) were found statistically at par with each other in respect to plant height, out of these treatment T₈ is significantly superior overtreatment T₁₀ (Organic mulch with paddy straw @ 20 q/ha) (54.11cm) and all these are superior over T₁ (Control weedy check) (50.80 cm).

At 90 DAT, the plant height ranged from (51.71cm to 68.58 cm), in which the treatment T₂ (Weed free) (68.58 cm) significantly higher, followed by (T₇) (Oxyfluorfen @ 1 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (65.47cm) ascompared to remaining treatments. However, the significantly lowest plant height was observed in T₁ (Control weedy check).Treatment T₈ (Two hand weeding at 25 and 45 DAT) (59.50cm),T₃ (Pendimethalin @ 1.75 kg/ha (pre-emergence))(58.81 cm), T₄(Oxyfluorfen @ 1 kg/ha (pre-emergence)) (58.90 cm), and T₅ (Quizalofop-ethyl @1 kg/ha (post-emergence) (56.95cm) were recorded comparable plant height and in turn they were significantly superior over treatment T₉ (Black polythene mulch) (56.30cm), T₁₀ (Organic mulch with paddy straw @ 20 q/ha) (55.32cm) and T₁ (Control weedy check) (51.71 cm).

At harvest, the plant height ranged from (50.70 cm to 67.38 cm), it was significantly higher (67.38 cm) with the treatment T₂ (Weed free), followed by T₇ (Oxyfluorfen @ 1 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (64.63cm) as compared to remaining treatments. However, the significantly lowest plant height was observed in T₁ (Control weedy check) (50.70 cm). Rest other weed management practices *i.e.* T₈ (Two hand weeding at 25 and 45 DAT) (58.89cm),T₃ (Pendimethalin @ 1.75 kg/ha (pre-emergence)) (57.53cm), T₄ (Oxyfluorfen @ 1 kg/ha (pre-emergence)) (57.59cm), and T₅ (Quizalofop-ethyl @1 kg/ha (post-emergence)) (55.94cm) were recorded significantly heighted plant in comparison to T₉ (Black polythene mulch) (55.73cm), T₁₀ (Organic mulch with paddy straw @ 20 q/ha) (54.58cm), T₁ (Control weedy check) (50.70cm).

Plant height at all the stages of crop growth *i.e.* 30, 60, 90 DAT and at harvest under this study, the tallest plant (68.58cm) was recorded in the treatment Weed free (T₂) which was at par with Oxyfluorfen @ 1 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence) (T₇) during all growth stages this might be due to low competition of onion plants with the weeds resulted more light for photosynthesis. Similar results were also reported by kalhapure *et al.* (2013), theyreported that the application of pendimethlin as pre-emergence and oxyfluorfen as post emergence was responsible for better growth and development of onion crop due to weed free environment.

Similar findings were also reported by Kumar and Mourya (2006) [7], Ghadage *et al.* (2006) [6], Channappagoudar and Biradar (2007) [4], Murthy *et al.* (2007) [8], and Sharma and Khandwe (2008), Chattopadhyay *et al.* (2016) [5].

Table 1: Effect of different weed management practices on plant height (cm.) of onion at 30, 60, 90 DAT*and at harvest

Treatment	Treatment detail	Plant height (cm)			
		30 DAT	60 DAT	90 DAT	At Harvest
T ₁	Control (Weedy check)	26.33	50.80	51.71	50.70
T ₂	Weed free	34.44	65.89	68.58	67.38
T ₃	Pendimethalin @ 1.75 kg/ha (pre-emergence)	32.43	56.80	58.81	57.53
T ₄	Oxyfluorfen @ 1 kg/ha (pre-emergence)	32.73	56.83	58.90	57.59
T ₅	Quizalofop-ethyl @ 1 kg/ha (post-emergence)	28.33	55.30	56.95	55.94
T ₆	Pendimethalin @1.750kg/ha(pre emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)	33.06	61.89	63.57	62.72
T ₇	Oxyfluorfen @ 1 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)	33.84	63.73	65.47	64.63
T ₈	Two hand weeding at 25 and 45 DAT	31.83	58.66	59.50	58.89
T ₉	Black polythene mulch	31.67	55.30	56.30	55.73
T ₁₀	Organic mulch with paddy straw @ 20 q/ha	30.90	54.11	55.32	54.58
	SEM±	1.56	1.17	1.00	1.04
	CD (P=0.05)	4.53	3.38	2.91	3.02

*DAT= Days after transplanting

2. Number of leaves/plant at 30, 60, 90 DAT and at harvest

Data recorded on average number of leaves/plant at 30, 60, 90 DAT and at harvest are presented in Table 2.

The number of leaves increased at a faster rate up to 30 DAT, thereafter, the rate of increase was at a slower rate. The maximum values were noticed at 90 DAT.

At 30 DAT the number of leaves/plant were differ non-significantly and ranged from (4.67 to 5.67). The number of leaves/plant was almost similar in all the treatments but it was the maximum value (5.67) with the treatment T₂ (Weed free) and the lowest number of leaves/plant was recorded in weedy check (T₁) (4.67).

At 60 DAT the number of leaves/plant ranged from (5.47 to 8.30). It was significantly higher (8.30) with the treatment T₂ (Weed free) as compared to remaining treatments, but at par with T₇ (Oxyfluorfen @ 1kg/ha (pre-emergence) + Quizalofop-ethyl @ 1kg/ha (post-emergence)) (7.33) and other treatment *i.e.* T₆ (Pendimethalin @ 1.750kg/ha (pre emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (7.00), T₈ (Two hand weeding at 25 and 45 DAT) (6.67), T₄ (Oxyfluorfen @ 1 kg/ha (pre-emergence)) (6.60), T₃ (Pendimethalin @ 1.75 kg/ha (pre-emergence)) (6.53), T₉ (Black polythene mulch) (6.47), were found superior over the Control weedy check (T₁) (5.47) in respect to number of leaves/plant at 30 DAT except T₁₀ (Organic mulch with paddy straw @ 20 q/ha) (6.00).

At 90 DAT the number of leaves/plant ranged from (6.48 to 10.00) it was significantly higher (10.00) with the treatment T₂ (Weed free) as compare to remaining treatments, however the treatment T₇ (Oxyfluorfen @ 1kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (8.33), T₈ (Two hand weeding at 25 and 45 DAT) (8.13), T₆ (Pendimethalin @ 1.750kg/ha (pre emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (8.07), T₄ (Oxyfluorfen @ 1 kg/ha (pre-emergence)) (8.00), T₃ (Pendimethalin @ 1.75 kg/ha (pre-emergence)) (7.73) and T₅ (Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (7.67) were recorded statistically at

par with each other in respect to number of leaves/plant, and all these treatment were significantly superior over treatment T₉ (Black polythene mulch) (7.47), T₁₀ (Organic mulch with paddy straw @ 20 q/ha) (6.00) and control weedy check (T₁) (6.48).

At harvest the number of leaves/plant ranged from (6.13 to 9.80), it was significantly higher (9.80) with the treatment T₂ (Weed free) as compared to remaining treatments, whereas the treatment T₇ (Oxyfluorfen @ 1kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (8.07), T₆ (Pendimethalin @ 1.750kg/ha (pre emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (7.87), T₈ (Two hand weeding at 25 and 45 DAT) (7.80), T₄ (Oxyfluorfen @ 1 kg/ha (pre-emergence)) (7.73), T₃ (Pendimethalin @ 1.75 kg/ha (pre-emergence)) (7.53), T₅ (Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (7.47) and T₉ (Black polythene mulch) (7.20), were found statistically at par with each other in respect to number of leaves/plant and superior over the T₁₀ (Organic mulch with paddy straw @ 20 q/ha) (7.13), Control weedy check (T₁) (6.13). However, the significantly lowest number of leaves/plant was recorded in Weedy check (T₁) (6.13).

Significantly higher number of leaves/plant was noted in T₂ (Weed free) (10.00), followed by T₇ (Oxyfluorfen @ 1kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) throughout the growing period.

The better weed control in above treatments right from early stage led to minimum crop-weed competition ultimately providing favourable environment for onion to utilize nutrients, light, space and moisture resulted higher number of leaves. The above findings are in close proximity with the results of Singh and Singh (1993). They recorded maximum number of leaves/plant (10.6) in weed free plot during growing period of onion.

The findings are also in close controlling to that of Nargis *et al.* (2006), Kumar and Mourya (2006) [7] and Sharma and Khandwe (2008), Chattopadhyay *et al.* (2016) [5].

Table 2: Effect of different weed management practices on number of leaves/plant of onion at 30, 60, 90 DAT* and at harvest

Treatment	Treatment detail	Number of leaves/plant			
		30DAT	60 DAT	90 DAT	At Harvest
T ₁	Control (weedy check)	4.67	5.47	6.48	6.13
T ₂	Weed free	5.67	8.30	10.00	9.80
T ₃	Pendimethalin @ 1.75 kg/ha (pre-emergence)	5.20	6.53	7.73	7.53
T ₄	Oxyfluorfen @ 1 kg/ha (pre-emergence)	5.27	6.60	8.00	7.73
T ₅	Quizalofop-ethyl @ 1 kg/ha (post-emergence)	4.93	6.33	7.67	7.47
T ₆	Pendimethalin @ 1.750 kg/ha (pre emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)	5.40	7.00	8.07	7.87
T ₇	Oxyfluorfen @ 1 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)	5.60	7.33	8.33	8.07
T ₈	Two hand weeding at 25 and 45 DAT	5.13	6.67	8.13	7.80
T ₉	Black polythene mulch	4.93	6.47	7.47	7.20
T ₁₀	Organic mulch with paddy straw @ 20 q/ha	4.80	6.00	7.40	7.13
	SEm±	0.22	0.36	0.29	0.30
	CD (P=0.05)	NS	1.06	0.84	0.88

*DAT= Days after transplanting

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