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SK Verma
Associate Professor, Horticulture
BTC College of agriculture & Research station, Bilaspur
IGKV, Raipur, Chhattisgarh, India

Manju Rani Sahu
Department of Vegetable Science
IGKV, Raipur, Chhattisgarh, India

Madan Kumar Jha
Department of Vegetable Science
IGKV, Raipur, Chhattisgarh, India

D Patel
Asst. Professor Horticulture
IGKV, Raipur, Chhattisgarh, India

Corresponding Author:
SK Verma
Associate Professor, Horticulture
BTC College of agriculture & Research station, Bilaspur
IGKV, Raipur, Chhattisgarh, India

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

SK Verma, Manju Rani Sahu, Madan Kumar Jha and D Patel

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 (Postemergence)), T8 (Two hand weeding at 25 and 45 DAT), T9 (Black polythene mulch), T10 (Organic mulch with paddy straw @ 20 q/ha). The plant height, number of leaves/plant, fresh weight, dry weight were found higher with treatments T7 (Oxyfluorfen @ 1 kg/ha (Pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (Postemergence)).

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. Its semi-cylindrical leaves emerge from a subterranean bulb, which bears fascicled, short and scarcely branched roots. 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 fruit is capsule, which contain black flat seeds. The edible bulb is composed of several overlapping layers on a central core. Onion possess as culinary, dietary and medicinal importance in daily life of people in the whole world, it is also a major vegetable crop to gain foreign currency.

It becomes a major cash crop with higher market demand and price. It is popularly known as "Queen of kitchen" because of its characteristic flavour and taste of food. Onion is a condiment crop, which is consumed fresh in salads or added in cooking dishes as a spice. Apart from furnishing nutrition, onion also provides relishing flavours to our diets. Recent research has suggested that onion in the diet may play a part in preventing heart diseases and other aliments (Sangha and Baring, 2003).

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]. Onion is very rich in various nutrients and vitamins like vitamin „A" thiamine, riboflavin, niacin and ascorbic acid and rest are the carbohydrates which make up the dry matter of the bulb. Under such circumstances application of herbicides offer a suitable method for weed control by producing maximum sized bulbs and higher yield.

The conventional method of weed control (hoeing and manual weeding) is very labourious, expensive and insufficient 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). Onion is slow growing, shallow rooted crop with narrow upright leaves and non-branching habit. Due to this type of growing habit, it cannot compete well with weeds. In addition to this, frequent irrigation and fertilizer application allows for successive flushes of weeds in onion.

Material and Methods
1. Leaf length (cm) at 30, 60, 90 DAT and at harvest
Lengths of three different sized leaves of each tagged plant were measured in each treatment at 30 days interval after transplanting.

2. Fresh weight/plant at 30, 60, 90 DAT and at harvest
This observation was recorded on randomly selected three competitive plants from each plots measured at 30 days intervals after transplanting i.e. a part of the plant which was above ground level was separated from the plant with the help of blade and it was weighed and noted as fresh weight of plants.

3. Dry matter of plant at 30, 60, 90 DAT and at harvest
After recording the fresh weight of shoots per plant the separate plant material was kept in Verandah for natural drying till 7-10 days. The sample was kept in the hot air oven for 12 to 24 hours at 600C till constant weight has been achieved and weighed on digital balance.

4. Crop growth rate (CGR) (g/day/m²)
The average daily increment in plant stand is an important characteristic. The CGR was calculated as in increase in dry production per unit ground area per unit time. In this investigation the crop growth rate was worked out with the help of following formula:

CGR= W2-W1/T2-T1

Where,
W1 = dry weight per unit area at t1
W2 = dry weight per unit area at t2
t1 = time of first sampling
t2 = time of second sampling

5. Relative growth rate (g/g/day)
The relative growth rate expresses the dry weight increase in time interval in relation to initial weight, in practical situations, the mean relative growth rate calculated from measurements at t_1 and t_2

RGR= LnW2-LnW1/T2-T1.

Where,
W_1 = dry weight per unit area at t_1
W_2 = dry weight per unit area at t_2
t_1 = time of first sampling t_2 = time of second sampling

Results and Discussion
1. Leaf length (cm) at 30, 60, 90 DAT and at harvest
The leaf length of onion was recorded at 30, 60, 90 DAT and at harvest and the results are presented in the Table 1
The leaf length increased at a faster rate upto 30 DAT, thereafter the rate of increase was at a slower rate. The maximum values were noticed at 90 DAT.
At 30 DAT the leaf length ranged from (19.91 cm to 26.40 cm), it was significantly higher (26.41 cm) with the treatment T_2 (Weed free) as compared to remaining treatments, except treatment T_7 (Oxyfluorfen @ 1 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (24.01 cm) and T_6 (Pendimethalin @ 1.750 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (23.8 cm). Pre-emergence application of herbicide either Oxyfluorfen or pendimethalin in treatment T_4 (Oxyfluorfen @ 1 kg/ha (pre-emergence)) (23.32 cm), T_3 (Pendimethalin @ 1.75 kg/ha (pre-emergence)) (23.25 cm), T_7 (Oxyfluorfen @ 1 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (24.01 cm) and T_6 (Pendimethalin @ 1.750 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (23.8 cm) recorded significantly longer leaves than post-emergence application of T_5 (Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (19.94 cm) but at par with other weed control method like T_8 (Two hand weeding at 25 and 45 DAT) (20.66 cm), T_9 (Black polythene mulch) (21.51 cm), T_{10} (Organic mulch with paddy straw @ 20 q/ha) (20.66 cm). The lowest leaf length recorded by T_1 (Control weedy check) (19.91).
At 60 DAT the leaf length significantly differ due to treatments and ranged from (31.67 cm to 46.83 cm), it was significantly higher (46.83 cm) with the treatment T_2 (Weed free) as compared to remaining treatments, but it was at par with T_7 (Oxyfluorfen @ 1 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (43.41 cm), however the treatment T_6 (Pendimethalin @ 1.750 kg/ha (pre emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (42.17 cm), T_8 (Two hand weeding at 25 and 45 DAT) (41.60 cm), T_4 (Oxyfluorfen @ 1 kg/ha (pre-emergence)) (41.57 cm), T_3 (Pendimethalin @ 1.75 kg/ha (pre-emergence)) (40.95 cm), T_5 (Quizalofop-ethyl @1 kg/ha (post-emergence)) (40.88)cm), T_9 (Black polythene mulch) (40.64 cm), T_{10} (Organic mulch with paddy straw @ 20 q/ha) (39.45 cm) were statistically at par with each other and the superior over the T_1 (Control weedy check). The minimum leaf length (31.67 cm) was recorded in Weedy check plot.

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

Treatment	Treatment detail	Leaf length (cm)			
		30 DAT	60 DAT	90 DAT	At Harvest
T_1	Weedy check	19.91	31.67	32.11	29.04
T_2	Weed free	26.40	46.83	48.31	47.13
T_3	Pendimethalin @ 1.75 kg/ha (pre-emergence)	23.25	40.95	41.66	37.64
T_4	Oxyfluorfen @ 1 kg/ha (pre-emergence)	23.32	41.57	42.44	37.75
T_5	Quizalofop-ethyl @1 kg/ha (post-emergence)	19.94	40.88	41.65	37.21
T_6	Pendimethalin´@ 1.750 kg/ha (pre emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)	23.81	42.17	43.02	39.19
T_7	Oxyfluorfen @ 1 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)	24.01	43.41	44.42	40.85
T_8	Two hand weeding at 25 and 45 DAT	20.66	41.60	42.50	37.99
T_9	Black polythene mulch	21.51	40.64	41.30	37.03
T_{10}	Organic mulching with paddy straw @ 20 q/ha	20.66	39.45	39.87	35.64
	SEm±	0.95	1.43	1.38	0.75
	CD (P=0.05)	2.75	4.13	4.01	2.17

*DAT= Days after transplanting

At 90 DAT the leaf length ranged from (32.11 cm to 48.31 cm) and it was significantly higher (48.31 cm) with the treatment T_2 (Weed free) as compared to remaining treatments, but it was at par with T_7 (Oxyfluorfen @ 1 kg/ha

(pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (44.42 cm). Treatment T_6 (Pendimethalin´@ 1.750 kg/ha (pre emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (43.02 cm), T_8 (Two hand weeding at 25 and 45 DAT) (42.50 cm), T_4 (Oxyfluorfen @ 1 kg/ha (pre-emergence)) (42.44 cm), T_3 (Pendimethalin @ 1.75 kg/ha (pre-emergence)) (41.66 cm), T_5 (Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (41.65 cm), T_9 (Black polythene mulch) (41.30 cm), and T_{10} (Organic mulch with paddy straw @ 20 q/ha) (39.87 cm) were statistically at par and were significantly superior over the Control weedy check plot (31.67 cm).

At harvest the leaf length ranged from 29.04 cm to 47.13 cm. All the weed management practices were recorded significantly longer leaves in comparison to weedy check. Among the weed control treatments T_2 (Weed free) (47.13 cm) was found superior as compared to remaining treatments, however the treatment T_7 (Oxyfluorfen @ 1 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (40.85cm), T_6 (Pendimethalin´@ 1.750 kg/ha (pre emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (39.19 cm), T_8 (Two hand weeding at 25 and 45 DAT) (37.99 cm), T_4 (Oxyfluorfen @ 1 kg/ha (pre-emergence)) (37.75 cm), T_3 (Pendimethalin @ 1.75 kg/ha (pre-emergence)) (37.64 cm), T_5 (Quizalofop-ethyl @1 kg/ha (post-emergence)) (37.21 cm), and T_9 (Black polythene mulch) (37.03 cm) recorded comparable leaf length and were significantly superior over the T_{10} (Organic mulch with paddy straw @ 20 q/ha) (35.64 cm).

Significantly higher leaf length/plant was recorded in treatment T_2 (Weed free) (48.31cm) but it was at par with T_7 (Oxyfluorfen @ 1 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (44.42 cm). Similar result reported by Ghaffoor (2004) and Kumar and Mourya (2006).

2. Fresh weight/plant at 30, 60, 90 DAT and at harvest (g)

The Fresh weight/plant of onion was recorded at 30, 60, 90 DAT and at harvest and the results are presented in the Table 2.

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

At 30 DAT the fresh weight/plant ranged from (9.10 g to 14.67 g) from the data evidence in table 4.4. Resulted all the treatments of weed management practices were found significantly superior over control T_1 (Weedy check). However, T_2 (Weed free) (14.67 g) recorded higher fresh weight as compare to pre-emergence application of herbicides but it was significantly superior over other weed management practices that is T_5 (Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (12.33 g), T_9 (Black polythene mulch) (12.47g), T_{10} (Organic mulch with paddy straw @ 20 q/ha) (12.34 g).

At 60 DAT the fresh weight/plant ranged from (28.00 g to 50.13 g) it was significantly superior with the treatment T_2 (Weed free) (50.13 g) as compared to remaining treatments, but it was at par with T_7 (Oxyfluorfen @ 1 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (49.07 g) and T_6 (Pendimethalin @ 1.750 kg/ha (pre emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (48.53 g). Other weed management treatments like T_8 (Two hand weeding at 25 and 45 DAT) (41.60 g), T_4 (Oxyfluorfen @ 1 kg/ha (pre-emergence)) (38.80 g), T_3 (Pendimethalin @ 1.75 kg/ha (pre-emergence)) (36.26 g) were statistically at par each other and significantly higher than T_5 (Quizalofop-ethyl @1 kg/ha (post-emergence)) (34.80 g), T_9 (Black polythene mulch) (32.92 g) and T_{10} (Organic mulch with paddy straw @ 20 q/ha) (30.13 g). The minimum fresh weight was recorded in T_1 (Weedy check plot) (28.88 g).

At 90 DAT the fresh weight/plant ranged from (78.46 g to 95.11 g), it was significantly higher (95.11 g) with the treatment T_2 (Weed free) as compared to remaining treatments, but was at par with T_7 (Oxyfluorfen @ 1 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (94.21 g) and T_6 (Pendimethalin´@ 1.750 kg/ha (pre emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (93.54 g). Treatment T_8 (Two hand weeding at 25 and 45 DAT) (86.89 g), T_4 (Oxyfluorfen @ 1 kg/ha (pre-emergence)) (85.71 g), T_3 (Pendimethalin @ 1.75 kg/ha (pre-emergence)) (85.65 g) and T_5 (Quizalofop-ethyl @1 kg/ha (post-emergence)) (83.46 g) were recorded statistically at par and found significantly superior over the (T_{10}) Organic mulch with paddy straw @ 20 q/ha (80.48 g), T_9 (Black polythene mulch) (80.42 g) and T_1 (Weedy check plot) (78.46 g).

At harvest the fresh weight/plant ranged from (76.80 g to 93.37 g), it was significantly higher (93.37 g) with the treatment T_2 (Weed free) as compared to remaining treatments, but was at par with T_7 (Oxyfluorfen @ 1 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (92.40 g) and T_6 (Pendimethalin´@ 1.750 kg/ha (pre emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (92.06 g), however the treatment T_8 (Two hand weeding at 25 and 45 DAT) (84.18 g), T_3 (Pendimethalin @ 1.75 kg/ha (pre-emergence)) (83.65 g), T_4 (Oxyfluorfen @ 1 kg/ha (pre-emergence)) (83.18 g), T_5 (Quizalofop-ethyl @1 kg/ha (post-emergence)) (81.89 g), T_9 (Black polythene mulch) (78.85 g) and T_{10} (Organic mulch with paddy straw @ 20 q/ha) (78.58 g) were found statistically at par with each other and significantly higher over the treatment T_1 (Control weedy check plot) (76.80 g) in respect to fresh weight.

Fresh weight of all the stages of crop growth *i.e*. 30, 60, 90 DAT and at harvest under this study. The highest fresh weight of onion plants was recorded under weed free (T_2) (95.11 g) which was at par with T_7 (Oxyfluorfen @ 1 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) and T_6 (Pendimethalin @ 1.750 kg/ha (pre emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) during all the growth stages. It is might be due to low weed population and more leaf area surface available which leads to more utilization of light, water and nutrients and photosynthesis resulting more carbohydrate production. These findings with the conformity of the results of Sharma and Khandwe (2008), Vishnu *et al*. (2015).

Table 2: Effect of different weed management practices on fresh weight (g) of plant of onion at 30, 60, 90 DAT* and at harvest

Treatment	Treatment detail	Fresh weight of plant (g)			
		30 DAT	60 DAT	90 DAT	At Harvest
T_1	Control (weedy check)	9.10	28.00	78.46	76.80
T_2	Weed free	14.67	50.13	95.11	93.37
T_3	Pendimethalin @ 1.75 kg/ha (pre-emergence)	12.87	36.26	85.65	83.65

T_4	Oxyfluorfen @ 1 kg/ha (pre-emergence)	13.88	38.80	85.71	83.18
T_5	Quizalofop-ethyl @1 kg/ha (post-emergence)	12.33	34.80	83.46	81.89
T_6	Pendimethalin´@ 1.750 kg/ha (pre emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)	13.11	48.53	93.54	92.06
T_7	Oxyfluorfen @ 1 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)	13.17	49.07	94.21	92.40
T_8	Two hand weeding at 25 and 45 DAT	12.57	41.60	86.89	84.18
T_9	Black polythene mulch	12.47	32.93	80.42	78.85
T_{10}	Organic mulch with paddy straw @ 20 q/ha	12.34	30.13	80.48	78.58
	SEm±	0.79	1.09	2.17	2.25
	CD (P=0.05)	2.31	3.17	6.29	6.52

*DAT= Days after transplanting

3. Dry matter of plant at 30, 60, 90 DAT and at harvest (g)

The dry weight/plant of onion was recorded at 30, 60, 90 DAT and at harvest and the results are presented in the Table 3.

Dry weight increased with the advancement of growth stages and was found to be maximum at 90 DAT. Growth in terms of dry weight of the onion plant was slow initially up to 30 days; thereafter, rapid growth was recorded up to 60 DAT to harvest.

At 30 DAT the dry weight/plant ranged from (2.04 g to 3.84 g), it was higher (3.84 g) with the treatment T_2 (Weed free). Pre-emergence application of herbicide like Oxyfluorfen and Pendimethalin countaining treatments *i.e.* T_3 (Pendimethalin @ 1.75 kg/ha (pre-emergence)) (3.16 g), T_4 (Oxyfluorfen @ 1 kg/ha (pre-emergence)) (3.23 g), T_6 (Pendimethalin´@ 1.750 kg/ha (pre emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (3.15 g) and T_7 (Oxyfluorfen @ 1 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (3.18 g) were recorded significantaly higher dry weight in comparison to alone post emergence applied herbicide and other weed management practices. However, significantly lowest dry weight recorded by T_1 (Weedy check plot) (2.04 g)

At 60 DAT the dry weight/plant ranged from (3.25 g to 6.29 g), it is cleared from the table that T_2 (Weed free) (6.29 g), T_8 (Two hand weeding at 25 and 45 DAT) (5.25 g) and chemical weed control treatments were found statistically at par and in turn significantly superior over other treatments *i.e.* T_9 (Black polythene mulch) (4.21 g), T_{10} (Organic mulch with paddy straw @ 20 q/ha) (3.66 g) and T_1 (Control weedy check plot) (3.25 g). The lowest value recorded by treatment T_1 (Control weedy check plot) (3.25 g).

Table 3: Effect of different weed management practices on dry matter (g) of onion plant at 30, 60, 90 DAT* and at harvest

Treatment	Treatment detail	Dry matter (g) of plant			
		30 DAT	60 DAT	90 DAT	At harvest
T_1	Control (Weedy check)	2.04	3.25	5.36	9.08
T_2	Weed free	3.84	6.29	9.70	21.08
T_3	Pendimethalin @ 1.75 kg/ha (pre-emergence)	3.16	4.86	8.43	17.04
T_4	Oxyfluorfen @ 1 kg/ha (pre-emergence)	3.23	5.09	8.29	17.82
T_5	Quizalofop-ethyl @1 kg/ha (post-emergence)	2.68	4.48	7.55	16.12
T_6	Pendimethalin´@ 1.750 kg/ha (pre emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)	3.15	5.88	9.27	19.09
T_7	Oxyfluorfen @ 1 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)	3.18	6.23	9.58	19.78
T_8	Two hand weeding at 25 and 45 DAT	2.91	5.25	8.65	17.71
T_9	Black polythene mulch	3.01	4.21	7.23	15.70
T_{10}	Organic mulch with paddy straw @ 20 q/ha	2.98	3.66	7.05	13.82
	SEm±	0.25	0.62	0.34	0.9027
	CD (P=0.05)	0.72	1.80	1.00	2.6105

*DAT= Days after transplanting

At 90 DAT the dry weight/plant ranged from (5.36 g to 9.70 g), it was significantly higher (9.70 g) with the treatment T_2 (Weed free) as compared to remaining treatments, but it was at par with T_7 (Oxyfluorfen @ 1 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (9.58 g) and T_6 (Pendimethalin´@ 1.750 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (9.27 g). However, treatment T_8 (Two hand weeding at 25 and 45 DAT) (8.65 g), T_3 (Pendimethalin @ 1.75 kg/ha (pre-emergence)) (8.43 g) and T_4 (Oxyfluorfen @ 1 kg/ha (pre-emergence)) (8.29 g) were comparable to each other in term of dry weight of onion plant and these treatments were recorded higher dry weight than that of T_5 (Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (7.55 g), T_9 (Black polythene mulch) (7.23 g), T_{10} (Organic mulch with paddy straw @ 20 q/ha) (7.05 g) and T_1 (Weedy check plot) (5.36 g).Treatment (T_1) was found significantly minimum dry weight as compared to all the treatments.

At harvest the dry weight/plant ranged from (9.08 g to 21.08 g) it was significantly higher (21.08 g) with the treatment T_2 (Weed free) as compared to remaining treatments, but it was at par with T_7 (Oxyfluorfen @ 1 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (19.78 g) and T_6 (Pendimethalin´@ 1.750 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (19.09g), however treatment T_4 (Oxyfluorfen @ 1 kg/ha (pre-emergence)) (17.82 g), T_8 (Two hand weeding at 25 and 45 DAT) (17.71 g), T_3 (Pendimethalin @ 1.75 kg/ha (pre-emergence)) (17.04 g), T_5 (Quizalofop-ethyl @1 kg/ha (post-emergence)) (16.12 g) and T_9 (Black polythene mulch) (15.70 g) were recorded statistically at par with each other in respect to dry weight but all these treatments were superior over treatment T_{10} (Organic mulch with paddy straw @ 20 q/ha) (13.82 g) and T_1 (Control weedy check plot) (9.08 g).

Dry weight of plants at all the stages of crop growth *i.e.* 30, 60, 90 DAT and at harvest under this study. The highest dry weight (21.08 g) was recorded by weed free (T_2) followed by T_7 (Oxyfluorfen @ 1 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (19.78 g) and T_6 (Pendimethalin´@ 1.750 kg/ha (pre emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) (19.09 g) this might be due to the decreased competition of weed with crop

for space, water, air, nutrients, and sunlight because of their effective control as a result of application of different pre and post emergence herbicides. It provides better environment and other resources in sufficient quantity for the proper growth and development of crop. Similar results were also reported by Kalhapure *et al*. (2013), Sharma and Khandwe (2008).

4. Crop growth rate (CGR) (g/day/m²)

The crop growth rate (CGR) of onion crop was calculated for the period between 30 to 60 DAT, 60 to 90 DAT, 90 to at harvest. The values are depicted in Fig. 1. In general, CGR progressively increased upto at-harvest. A substantial jump in CGR was observed during the period of 60 to 90 DAT and 90 to at harvest. During all the growth stage weed free treatment recorded higher CGR except at 30 to 60 DAT and where treatment T_7 (Oxyfluorfen @ 1 kg/ha (pre-emergence) + Quizalofop-ethyl @ 1 kg/ha (post-emergence)) recorded initial higher growth rate. However, lowest CGR recorded by treatment T_1 (Weedy check) throughout the growth period.

This shows increase in the efficiency of leaves and relatively high dry matter production at the earlier periods. Similar trend has been reported by Ashok *et al*. (2013).

5. Relative growth rate (g/g/day)

The Relative growth rate (RGR) of onion crop was calculated for the period between 30-60 DAT, 60-90 DAT, 90-at harvest. The values are depicted in Fig. 2. Maximum RGR values were recorded at 90-at harvest weed free treatment (0.025 g/g/day). Minimum RGR values were recorded at 30 to 60 DAT with (T_{10}) (0.006 g/g/day).

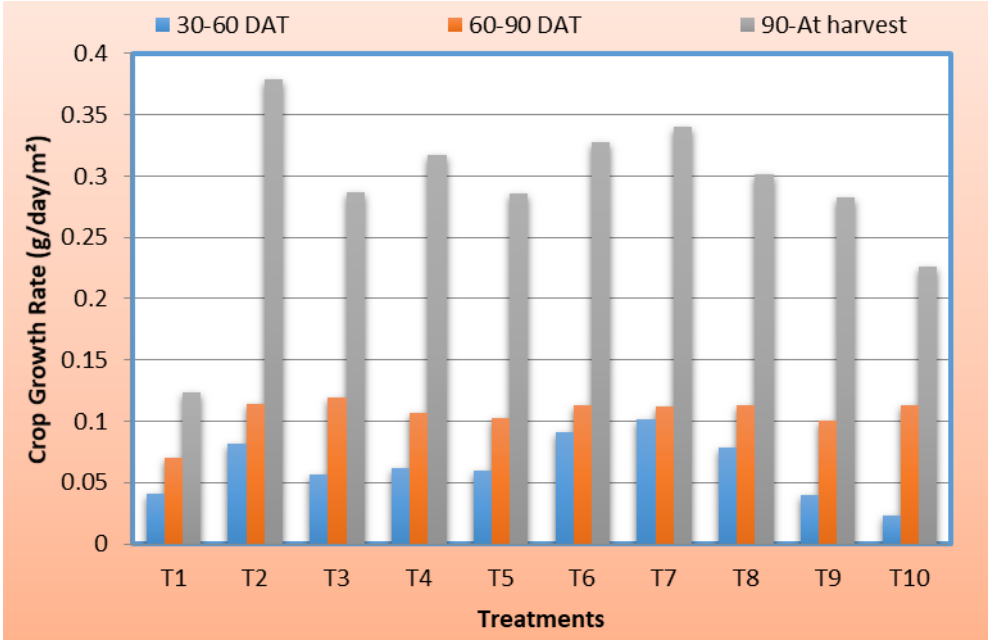

Fig 1: Effect of different weed management practices on crop growth rate (g/day/m²) of plant of onion

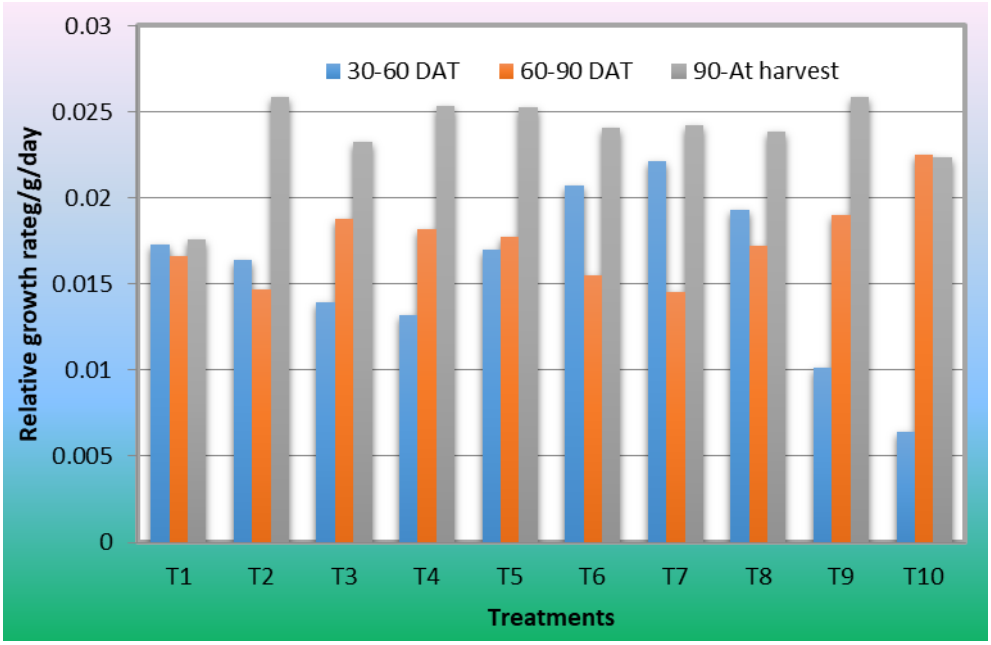

Fig 2: Effect of different weed management practices on Relative growth rate (g/g/day) of plant of onion

This shows increase in the efficiency of available leaf and relatively high dry matter production at the earlier periods. Similar trend has been reported by Ashok *et al*. (2013).

References

1. Anonymous, 2014-15. *www.nhrdf.com*

2. Anonymous. Area, production and Productivity. Directorate Horticulture, Ministry of Agriculture, Government of Chhattisgarh, Raipur (C.G.), 2013.
3. Anonymous. Area and production of onion in India. Indian Horticulture Database, National Horticultural Board, Ministry of Agriculture, GOI, Gurgaon, Haryana. 2014a, P.164 (*www.nhb.gov.in*)
4. Ashok P, Sasikala k, Pal Netra. Growth analysis studies in onion (*Allium cepa* L.). International Journal of Farm Sciences. 2013; 3(1):30-46.
5. Ghaffoor A. Integrated weed management in different varieties of onion (*Allium cepa* L.). Pak Jour of Weed Science Research. 2004; 10(1/2):5.
6. Sharma RC, Khandwe R. Response of weed control measures in kharif onion. Research on Crops. 2008; 9(2):348-349.
7. Vishnu Vikas, Asodaria KB, Suthar Ashok. Weed management in rabi onion (*Allium cepa* L.). Agricultural Research Communication Centre. 2015; 35(2):130-133.