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Effect of Mulching on Growth, Yield and Quality Characters of Onion (*Allium cepa* L.)

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ABSTRACT

A field experiment was conducted to find out the effect of mulching on different characters of onion during the months of December 2021 to March 2022 at Vegetable Research Farm at Lovely Professional University, Phagwara, Punjab. Field research was laid out in randomized block design with 10 treatments and three replications to check interactions between two onion varieties (Onion 888 and Red Coach) and mulching. Results revealed that yield and yield contributing characters were mostly found maximum in T_1 (black polythene mulch) as compared to other mulches while minimum results found in control. Qualitative parameters viz., TSS, dry matter and ascorbic acid were found significantly maximum in black polythene mulch than other mulch treatment.

Key words: Mulching, onion, growth, yield, quality, zero hunger

INTRODUCTION

Onion (*Allium cepa*), (family–Alliaceae or Amaryllidaceae) is a cash crop and one of the most important monocotyledonous bulb vegetable crops of India known as 'garibo ki kasturi'. It is rich source of different minerals like phosphorus, calcium and carbohydrates, protein and vitamin C, etc. Onion is used as salad, curries, chutneys and pickles. Apart from fresh consumption, onions are excellent raw materials for the processing sector, because they are processed into dried powder, rings, shreds and onion in vinegar or brine (Mahajan *et al.,* 2018). Allyl propyl disulphide is a colourless, odourless volatile chemical responsible for pungency found in crushed onion bulb. Quercetin, powerful antioxidant, is responsible for the colour of the outer skin. Anticancerous agent is also found in onion. Root system of onion is shallow so it does not absorb water from a very long depth i.e. more than 60 cm so upper layer of soil should be completely saturated with water (Kader *et al.,* 2019). Also, onion yield is also influenced by soil structure, soil fertility and weed infestation. Therefore, mulching can be a good alternative for moisture conservation, minimizing weed and conserving soil temperature. The application of living as well as non-living mulch on surface of soil provides optimum growing conditions (Kader *et al.,* 2017a). Black and silver polythene mulch or organic mulch is a reasonable method to conserve soil moisture (Sharma and Bhardwaj, 2017). Plastic mulches are also used for soil solarization as well as to control pest and improving soil health. Therefore, present study was undertaken to find out the effect of mulching on growth, yield and quality characters in onion.

MATERIALS AND METHODS

The trial was conducted at Vegetable Research Farm, Lovely Professional University, Phagwara, Punjab during December 2021 to March 2022. The experiment was laid out in a two-factor randomized block design replicated thrice. Ten mulching materials viz., Control (T_1), Black polythene mulch (T_2), Silver polythene mulch (T_3), Dry leaves mulch (T_4), Vermicompost mulch (T_5), Wheat straw mulch (T_6), Dry grass mulch (T_7), Saw dust mulch (T_8), Sugarcane Bagasse mulch (T_9) and Weedy plot (T_{10}) and two varieties i.e. Onion 888 (V_1) and Red Coach (V_2) were used in present experiment. In the month of December, seeds

were sown in pro tray filled with vermicompost, perlite and vermiculite in a 2:1:1 ratio, respectively. The plants were ready to be transplanted after 30-45 days. Before transplanting, black and silver polythene mulch was applied while other mulches were spread after transplanting at the time of minimum moisture present in the field. Before transplanting, polythene mulch was spread on the bed (bed size = 2 x 1 m) and holes were punched in the polythene sheet with a spacing of 15 x 10 cm. Different characters, namely, plant height (cm) at 45 DAT, 60 DAT and at last harvesting, number of leaves at 45 DAT, 60 DAT and at last harvesting, leaf length at 45 DAT, 60 DAT and at last harvesting, days to 50% neck fall, neck thickness (mm), polar diameter (mm), equatorial diameter (cm), average bulb weight (g), bulb yield (t/ha), TSS (^{0}Brix), dry matter content (%) and ascorbic acid (mg/100 g) were measured. The mean data of randomly selected plants were statistically analyzed with OP Stat software to find out variability of material for each trait.

RESULTS AND DISCUSSION

Plant height was found maximum in T_1–Black polythene mulch (43.04, 62.91 and 51.35 cm) which was at par with T_2–Silver polythene mulch (41.85, 62.7 and 46.4 cm) at 45, 60 days and at last harvesting, whereas minimum plant height was recorded in T_0–Control treatment at each stage (Table 1). Mean value for plant height at 45, 60 days and at last harvesting among two varieties, Red Coach variety had max. plant height (36.09, 59.67 and 50.60 cm) as compared to Onion 888 variety (31.92, 50.54 and 44.68 cm). Interrelation between 10 mulches and two different varieties showed that maximum plant height (47.21,70.50 and 56.17 cm) at 45, 60 days and at last harvest was observed in T_1V_2 followed by T_2V_2 silver polythene mulch (46.58, 69.58 and 47.69 cm). Red Coach variety cultivated under black polythene mulch was statistically significant over the other treatment, while the lowest plant height (26.79, 42.22 and 36.97 cm) at 45, 60 days and at last harvesting, respectively, was found in T_0V_1 Onion 888 variety cultivated under no mulch plot (control). In the current investigation of various mulching materials, growth parameters such as plant height at 45, 60 days and at harvest

Table 1. Effect of mulching on growth characters of onion

Treatment	Plant height at 45 DAT (cm)			Plant height at 60 DAT (cm)			Plant height at harvest (cm)			No. of leaves at 45 DAT			No. of leaves at 60 DAT			No. of leaves at harvest		
	V_1	V_2	Mean	V_1	V_2	Mean	V_1	V_2	Mean	V_1	V_2	Mean	V_1	V_2	Mean	V_1	V_2	Mean
T_0	26.79	27.16	26.98	43.22	43.44	43.33	36.97	40.61	38.79	3.87	3.93	3.90	5.80	6.13	5.97	5.90	6.30	6.10
T_1	38.87	47.21	43.04	55.32	70.50	62.91	46.53	56.17	51.35	5.80	5.73	5.77	8.53	8.73	8.63	10.20	8.90	9.55
T_2	37.11	46.58	41.85	55.82	69.58	62.7	45.10	47.69	46.40	5.27	5.60	5.43	8.23	7.73	7.98	10.13	8.47	9.30
T_3	27.42	32.76	30.09	47.66	57.94	52.80	48.71	51.40	50.06	4.07	4.07	4.07	6.45	6.27	6.36	8.30	7.60	7.95
T_4	35.37	35.32	35.34	52.62	58.88	55.75	45.09	53.40	49.25	4.73	4.47	4.60	6.47	6.60	6.53	9.50	7.53	8.52
T_5	33.67	38.47	36.07	54.53	62.50	58.52	45.47	50.03	47.75	4.80	4.67	4.73	6.80	7.00	6.90	6.93	7.93	7.43
T_6	29.84	36.93	33.38	49.65	61.08	55.37	46.21	53.80	50.00	4.47	4.47	4.47	6.67	6.60	6.63	7.77	6.50	7.13
T_7	34.17	34.93	34.55	54.09	60.26	57.17	44.63	52.75	48.69	4.53	4.27	4.40	6.07	6.47	6.27	8.40	6.80	7.60
T_8	28.40	30.22	29.31	45.07	56.77	52.92	37.59	47.63	42.61	4.33	4.33	4.33	5.80	6.33	6.07	7.20	6.97	7.08
T_9	27.55	31.35	29.45	47.42	55.76	51.59	45.10	47.69	46.40	4.07	4.13	4.10	4.93	5.07	5.00	5.33	6.00	5.67
Mean	31.92	36.09		50.54	59.67		44.68	50.60		4.59	4.56		6.58	6.69		7.97	7.30	
	T	V	T × V	T	V	T × V	T	V	T × V	T	V	T × V	T	V	T × V	T	V	T × V
S.Em	1.337	0.598	1.890	1.546	0.691	2.186	2.064	0.923	2.919	0.489	NS	NS	0.202	0.090	0.286	0.307	0.137	0.434
C. D. (P=0.05)	3.842	1.718	NS	4.442	1.987	NS	5.932	2.653	NS	0.17	0.07	0.24	0.580	NS	0.128	0.883	0.395	1.248

T_0: Control, T_1: Black polythene mulch, T_2: Silver polythene mulch, T_3: Dry leaves mulch, T_4: Vermicompost mulch, T_5: Wheat straw mulch, T_6: Dry grass mulch, T_7: Saw dust mulch, T_8: Sugarcane Bagasse mulch, T_9: Weedy plot, V_1: Onion 888 and V_2: Red Coach. NS–Not Significant.

after transplanting were higher in black polythene mulch (T_1) followed by silver polythene mulch (T_2) and minimum in control (T_0). These results are similar with the results of Masalkar *et al.* (2014) and Urraiya and Jha (2017), who revealed that plant height significantly increased under mulch treatment.

Highest number of leaves at 45, 60 days and at last harvesting was found maximum in T_1 (Black polythene mulch), whereas minimum was observed in control (T_0). Interrelation between 10 mulches and two different varieties showed that maximum number of leaves (5.80) at 45 days was observed in T_1V_1 Onion 888 variety cultivated under black polythene mulch which was statistically non-significant over the other treatment, while the least number of leaves per plant (3.87) at 45 days was found in T_0V_1 (Onion 888 variety cultivated without mulch). Maximum numbers of leaves (8.73) at 60 days were observed in T_1V_2, Red Coach variety cultivated under black polythene mulch which was statistically non-significant over the other treatment, while the least number of leaves per plant (4.93) at 60 days was found in T_9V_1 Onion 888 variety cultivated without mulch. In the current investigation of various mulching materials, growth parameters such as number of leaves at 45, 60 days and at harvest after transplanting were higher in black polythene mulch (T_1) followed by silver polythene mulch (T_2) and minimum in control (T_0). Increased number of leaves in mulched treatment may be affected by atmosphere and soil moisture (Table 1). Current experimental result is same as findings of Prasad *et al.* (2017) and Urraiya and Jha (2017).

Highest leaf length at 45 and 60 days after transplanting (39.66 and 56.85 cm) was observed in (T_1) black polythene mulch which was at par with treatments (T_2) silver polythene mulch (38.55 and 54.59 cm), whereas minimum leaf length at 45 days was recorded in (T_0) control treatment (25.31 and 38.16 cm). Mean value for leaf length among two varieties, Red Coach variety had maximum plant leaf length (33.43 and 53.32 cm) as compared to Onion 888 variety (29.11 and 43.91 cm) at 45 and 60 days, respectively (Table 2). Highest leaf length at harvest after transplanting (44.90 cm) was observed in (T_2) silver polythene mulch which was at par with treatment (T_7) saw dust mulch (44.21 cm), whereas minimum leaf length at harvest was recorded in (T_0) control treatment (29.36 cm). Mean value for leaf length at harvest time among two varieties, Red Coach variety had maximum leaf length at harvest (44.76 cm) as compared to Onion 888 variety (37.18 cm).

Interrelation between 10 mulches and two different varietieties showed that maximum leaf length (43.48 and 62.01 cm) at 45 and 60 days was observed in T_1V_2 followed by T_2V_2 silver polythene mulch (43.42 and 61.83 cm). Red Coach variety cultivated under black polythene mulch was statistically non-significant over the other treatment, while the lowest leaf length (25.14 and 37.61 cm) at 45 and 60 days, respectively, was found in T_0V_1 Onion 888 variety cultivated under no mulch plot (control). Maximum leaf length (49.14 cm) at harvest was observed in T_2V_2 followed by T_1V_2 black polythene mulch (48.46 cm). Red Coach variety cultivated under black polythene mulch which was statistically non-significant over the other treatment, while the lowest leaf length (27.60 cm) at harvest was found in T_0V_1 Onion 888 variety cultivated under no mulch plot (control). Better leaf length resulted in mulched treatments due to control of soil moisture and more nutrient availability thereby reducing weed population. These results are similar with the findings of Prasad *et al.* (2017) who reported that growth parameters were significantly increased under mulched treatment due to soil moisture.

Among the different mulches, lowest days to 50% neck fall (94.67) were observed in (T_2) silver polythene mulch which was at par with treatment (T_1) black polythene mulch (94.83) and it was statistically significant over the other treatment, whereas maximum days to 50% neck fall were recorded in (T_0) control (105.17). Mean value for days to 50% neck fall among two varieties, Onion 888 variety had maximum days to 50% neck fall (110.13) as compared to Red Coach variety (94.67). Interrelation between 10 mulches and two different varieties showed that minimum days to 50% neck fall (85.33) were observed in T_1V_2 which were at par with T_2V_2 (86.00). Red Coach variety cultivated under silver polythene mulch was statistically significant over the other treatment, while the highest days to 50% neck fall were found in T_0V_1 Onion 888 variety cultivated under control (Table 2).

In the current experiment on various mulching materials, growth parameters of days to 50% neck fall after transplanting were maximum in un-mulched plot (T_0) control followed by (T_9) weedy plot and minimum days to 50% neck fall were observed in (T_2) silver polythene mulch. No mulch or control treatment took more days to achieve 50% neck fall, whereas mulch treatment took least days to 50% neck fall. Because of high soil moisture in mulch treatment, plant growth was more vigorous than un-mulched treatment.

Among the different mulches, highest neck thickness (14.97 mm) was observed in (T_1) black polythene mulch and it was statistically significant over the other treatment followed by treatment (T_2) silver polythene mulch (12.10 mm), whereas minimum neck thickness was recorded in (T_0) control (8.61 mm). Mean value for neck thickness among two varieties, Red Coach variety had maximum neck thickness (11.28) as compared to Onion 888 variety (10.41). Interrelation between 10 mulches and two different varieties showed that maximum neck thickness (15.50 mm) was observed in T_1V_2, which was statistically significant over the other treatment, while the lowest neck thickness was found in T_0V_1 Onion 888 variety cultivated under control (8.26 mm). Neck thickness was significantly more in polythene mulch treatment as compared to un-mulched treatment (Table 3). Bappy *et al.* (2021) reported polythene mulch increased neck thickness.

Among the different mulches, highest polar and equatorial diameters (56.90 and 68.43 mm) were observed in (T_1) black polythene mulch which was at par with (T_2) silver polythene mulch (54.53 and 66.33 mm) and it was statistically significant over the other treatment, whereas minimum polar diameter was recorded in (T_9) weedy plot (35.75 and 36.12 mm), respectively (Table 3). Mean value for polar and equatorial diameters among two varieties, Red Coach variety had max. polar diameter (48.23 and 53.51 mm) as compared to Onion 888 variety (44.34 and 49.47 mm). Interrelation between 10 mulches and two different varieties showed that maximum polar and equatorial diameter (57.07 and 70.56 mm) was observed in T_1V_2, which was statistically non-significant over the other treatment, while the lowest polar diameter was found in T_9V_1 Onion 888 variety cultivated under weedy plot (33.58 and 34.41 mm). Increased polar and equatorial diameters of bulb under mulch treatment due to early vegetative growth gave better bulb. These findings are similar with results of Prasad *et al.* (2017) and Rachel *et al.* (2018).

Among the different mulches, highest bulb weight (123.19 g) was recorded in (T_1) black polythene much which was at par with treatment (T_2) silver polythene mulch (121.58 g) and it was statistically significant over the other treatment (Table 3), whereas minimum bulb weight was recorded in (T_0) control plot (48.76 g). Mean value for bulb weight among two varieties, Red Coach variety had maximum bulb weight (94.52) as compared to Onion 888 variety (88.88 g). Interrelation between 10

Table 2. Effect of mulching on growth characters of onion

Treatment	Leaf length at 45 DAT (cm)			Leaf length at 60 DAT (cm)			Leaf length at harvest (cm)			Days to 50% neck fall		
	V_1	V_2	Mean	V_1	V_2	Mean	V_1	V_2	Mean	V_1	V_2	Mean
T_0	25.14	25.49	25.31	37.61	38.71	38.16	27.06	31.66	29.36	116.33	94.00	105.17
T_1	35.83	43.48	39.66	51.70	62.01	56.85	37.73	48.46	43.09	104.33	85.33	94.83
T_2	33.69	43.42	38.55	47.36	61.83	54.59	40.67	49.14	44.90	103.33	86.00	94.67
T_3	25.13	30.14	27.63	42.11	52.75	47.43	38.12	46.67	42.4	108.00	89.33	98.67
T_4	32.54	32.97	32.75	43.95	52.52	48.23	39.86	43.38	41.62	108.33	87.67	98.00
T_5	30.77	34.56	32.66	47.09	55.47	51.28	40.27	47.71	43.99	107.33	88.00	97.67
T_6	27.01	34.05	30.53	42.88	53.06	47.97	40.14	46.38	43.26	112.00	91.33	101.67
T_7	29.69	32.63	31.16	45.47	54.18	49.83	40.47	47.95	44.21	111.67	88.67	100.17
T_8	25.93	28.12	27.03	40.16	51.18	45.67	36.7	47.80	42.29	114.00	90.33	102.17
T_9	25.39	29.42	27.41	40.75	50.59	45.67	30.74	38.41	34.57	116.00	92.33	104.17
Mean	29.11	33.43		43.91	53.23		37.18	44.76		110.13	89.30	
	T	V	T × V	T	V	T × V	T	V	T × V	T	V	T × V
S. Em	1.10	0.49	1.55	1.26	0.56	1.79	2.064	0.923	2.919	0.627	0.280	0.887
C. D. (P=0.05)	3.164	1.415	NS	4.442	1.987	NS	5.932	2.653	NS	1.802	0.806	2.548

Treatment details are given in Table 1. NS–Significant.

Table 3. Effect of mulching on yield and yield contributing characters

Treatment	Neck thickness (mm)			Polar diameter (mm)			Equatorial diameter (cm)			Average bulb weight (g)			Bulb yield (t/ha)		
	V_1	V_2	Mean	V_1	V_2	Mean	V_1	V_2	Mean	V_1	V_2	Mean	V_1	V_2	Mean
T_0	8.26	8.96	8.61	36.16	41.42	38.79	38.85	40.61	39.73	44.80	52.72	48.76	8.96	10.54	9.75
T_1	14.44	15.50	14.97	57.07	56.74	56.90	66.30	70.56	68.43	119.35	127.02	123.19	23.87	25.40	24.64
T_2	11.53	12.68	12.10	52.99	56.08	54.53	63.73	68.93	66.33	118.70	124.46	121.58	23.74	24.89	24.31
T_3	9.94	10.11	10.02	46.48	49.94	48.21	49.31	52.44	50.88	84.65	95.45	90.05	16.93	19.09	18.01
T_4	10.08	11.25	10.66	42.51	48.34	45.42	47.81	52.32	50.06	81.92	95.03	88.48	16.38	19.01	17.70
T_5	10.89	11.54	11.21	40.36	44.83	42.59	48.71	55.87	52.29	107.98	97.69	102.83	21.60	19.54	20.57
T_6	10.07	11.10	10.59	47.91	49.26	48.58	49.58	51.71	50.64	73.62	99.93	86.78	14.72	19.99	17.36
T_7	9.84	10.91	10.37	43.62	49.25	46.43	48.15	53.98	51.07	101.21	101.75	101.48	20.24	20.35	20.30
T_8	10.35	11.60	10.97	42.8	48.61	45.70	47.88	50.86	49.37	102.12	93.22	97.67	20.42	18.64	19.53
T_9	8.71	9.12	8.91	33.58	37.92	35.75	34.41	37.82	36.12	54.43	57.93	56.18	10.89	11.59	11.24
Mean	10.41	11.28		44.34	48.23		49.47	53.51		88.88	94.52		17.78	18.90	
	T	V	T × V	T	V	T × V	T	V	T × V	T	V	T × V	T	V	T × V
S. Em	0.307	0.137	0.434	0.971	0.434	1.373	1.373	0.614	1.942	1.091	0.488	1.543	0.218	0.097	0.308
C. D. (P=0.05)	0.882	0.394	NS	2.790	1.248	NA	3.946	1.765	NA	3.136	1.403	4.435	0.626	0.280	0.886

Treatment details are given in Table 1. NS–Not Significant.

mulches and two different varieties showed that maximum bulb weight (127.02 g) was observed in T_1V_2 which was at par with T_2V_2 (124.46 g), whereas the lowest bulb weight was found in T_0V_1 Onion 888 variety cultivated under control (44.80 g). Because of successful weed control, good moisture conservation and ideal microenvironment, the overall bulb production was best under the mulch treatment. It could be related to the lower soil temperature under the mulch compared to the control. These findings are similar to the results of Job *et al.* (2016), Rachel *et al.* (2018), Firissa *et al.* (2019) and Bappy *et al.* (2021) who found relatable results.

Among the different mulches, highest bulb yield per ha (24.64 t) was observed in (T_1) black polythene mulch which was at par with (T_2) silver polythene mulch (24.31 t), and it was statistically significant over the other treatment followed by treatment (Table 3), whereas minimum bulb yield per plot was recorded in (T_0) control (9.75 t). Mean value for yield among two varieties, Red Coach variety had maximum bulb yield per plot (18.90 t) as compared to Onion 888 variety (17.78 t). Interrelation between 10 mulches and two different varieties showed that maximum bulb production was observed in T_1V_2 (25.40 t) which was at par with T_2V_2 Red Coach variety under silver polythene mulch (24.89 t), while the lowest bulb production per plot was found in T_0V_1 Onion 888 variety cultivated under control (8.96 t). In the current experiment on various mulching materials, yield parameters of bulb yield were maximum in black polythene mulch (T_1) followed by (T_2) silver polythene mulch and minimum bulb weight was observed in (T_0) control. Successful weed control, good moisture conservation and ideal microenvironment, the overall bulb production was best under the polythene mulch treatment. It could be related to the lower soil temperature under the wheat straw mulch compared to the other mulch material. These results are in agreement with the findings of Temesgen *et al.* (2018), Firissa *et al.* (2019), Sarkar *et al.* (2019) and Bappy *et al.* (2021).

Among the different mulches, highest TSS content and ascorbic acid content (15.65 ^{0}Brix and 14.37 mg/100 g) were observed in (T_1) black polythene mulch, whereas minimum values for both characters were recorded in (T_9) weedy plot (10.52 ^{0}Brix and 10.35 mg/100 g),

Table 4. Effect of mulching on quality characters

Treatment	TSS (^{0}Brix)			Ascorbic acid (mg/100 g)			Dry matter (%)		
	V_1	V_2	Mean	V_1	V_2	Mean	V_1	V_2	Mean
T_0	12.03	12.70	12.36	10.28	9.68	9.98	10.75	10.21	10.48
T_1	15.77	15.53	15.65	11.88	11.30	11.59	14.82	13.91	14.37
T_2	15.63	15.20	15.41	12.91	12.92	12.92	12.53	12.26	12.40
T_3	15.50	14.40	14.95	11.09	10.56	10.83	12.79	11.94	12.37
T_4	14.30	14.63	14.46	11.21	10.68	10.95	13.25	10.21	11.73
T_5	14.08	12.96	13.52	11.62	11.07	11.35	11.33	11.76	11.55
T_6	13.67	14.56	14.12	10.76	10.24	10.50	12.46	11.38	11.92
T_7	13.15	13.96	13.56	9.78	9.31	9.54	11.96	12.39	12.18
T_8	15.63	15.09	15.36	11.00	10.47	10.73	13.96	13.02	13.49
T_9	10.91	10.12	10.52	9.22	10.31	9.77	10.33	10.37	10.35
Mean	14.07	13.91		10.98	10.65		12.42	11.75	
	T	V	T × V	T	V	T × V	T	V	T × V
S. Em	0.169	0.075	0.239	0.223	0.100	0.315	0.253	0.113	0.358
C. D. (P=0.05)	0.485	NS	0.686	0.641	0.286	NS	0.728	0.326	1.030

Treatment details are given in Table 1. NS–Not Significant.

respectively (Table 4). Mean value for TSS and ascorbic acid among two varieties, Onion 888 variety had maximum values (14.07 ^{0}Brix and 10.98 mg/100 g) as compared to Red Coach variety (13.91 ^{0}Brix and 10.65 mg/100 g). Interrelation between 10 mulches and two different varieties showed that maximum TSS (15.77 ^{0}Brix) was observed in T_1V_1 which was at par with T_2V_1 Onion 888 variety under silver polythene mulch (15.63 ^{0}Brix), while the lowest TSS content was found in T_9V_2 Red Coach variety cultivated under weedy plot (10.52 ^{0}Brix). Ascorbic acid content was found maximum in T_2V_2 (12.92 mg/100 g), whereas minimum in T_9V_1 (9.22 mg/100 g). Maximum dry matter was observed in T_1V_1 (14.82%) which was at par with T_8V_1 sugarcane mulch (13.96%). Onion 888 variety cultivated under black polythene mulch was statistically significant over the other treatment, while the lowest dry matter content was found in T_0V_2 Red Coach variety cultivated under control (Table 4). TSS content of bulb was significantly higher in mulched plot bulb than un-mulched treated bulb which might be due to higher soil moisture conservation which led to higher nutrient uptake. Dry matter content resulted in significantly more in mulched treatment than un-mulched treatment. These findings are in agreement with those of Akter (2017) and Bappy *et al.* (2021).

Among the different mulches, highest ascorbic acid content (12.92%) was observed in (T_2) silver polythene mulch and it was statistically significant over the other treatment followed by treatment (T_1) black polythene mulch (11.59%), whereas minimum ascorbic acid was recorded in (T_9) weedy plot (9.77%). Mean value for ascorbic acid among two varieties, Onion 888 variety had maximum ascorbic acid (10.98%) as compared to Red Coach variety (10.65). Interrelation between 10 mulches and two different varieties showed that maximum ascorbic acid (12.92%) was observed in T_2V_2 Red Coach variety cultivated under silver polythene mulch which was statistically non-significant over the other treatment, while the lowest ascorbic acid content was found in T_9V_1 Onion 888 variety cultivated under weedy plot. In the current experiment on various mulching materials, ascorbic acid content was maximum in (T_2) silver polythene mulch, followed by (T_1) black polythene mulch and minimum TSS content was observed in (T_9) weedy plot. This finding is similar to that of Sarkar *et al.* (2019).

CONCLUSION

The use of mulch is a better option in a water demanding crop, for reducing weed population, conserving soil moisture and enhancing crop production efficiency by many folds. Based on findings, it may be concluded that application of black polythene mulch had positive effect on the yield in both the varieties so it could be recommended to the farmers for better quality vegetable crop production.

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