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Effect of Mulching on Growth, Yield and Quality in Different Varieties of Summer Squash (*Cucurbita pepo* L.)

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A B S T R A C T

With rewarding possibilities of mulching in enhancing crop growth, present investigations were carried out in summer squash to investigate the effect of mulching on growth, yield and quality parameters in different varieties. The experiment was conducted with twenty different treatment combinations involving five different mulch materials (black plastic mulch, blue plastic mulch, transparent mulch, rice straw mulch and control) and four different varieties of summer squash (Arpit, Surya, Pratap and Desi) following Split Plot Design with three replications. From the observations recorded, Black plastic mulch showed significant improvement in growth and yield of summer squash, while among the varieties "Surya" produced greater yield than others. Based upon the studies, it can be concluded that for commercial cultivation of summer squash, 'Surya' variety should be grown under black plastic mulch.

Introduction

Summer Squash (*Cucurbita pepo* L.) locally known as 'chappankaddoo' or 'valyatikaddoo' belongs to family cucurbitaceae is a native of Mexico and US. In India, Uttar Pradesh, Punjab and Haryana are the states where summer squash is considered among commonly consumed vegetable crops (Dhaliwal, 2012) with cultivation limits extending to Himachal Pradesh, Jammu and Kashmir and West Bengal. It is tender, annual, warm season vegetable crop that is harvested when fruits are immature (Sarhan *et al.*, 2011) and contains carbohydrates, fibre, potassium, vitamin B and vitamin C that makes it higher in food value.

India share 14.78% production of squashes, pumpkins and gourds to worlds total production and stands at second position after China (22.83%) (Anonymous, 2016).

Despite having appreciable production, productivity is very low in India which is a major concern in commercial cultivation of summer squash and the main factors contributing towards low productivity are weeds infestation, insects, pests and moisture stress. To combat all these problems in eco-friendly manner, mulching offers rewarding possibilities as use of intensive chemical measures leads to disturbance of ecological balance. Covering of soil with different mulch materials is an efficient method for soil and

water conservation along with weed management (Bobby *et al.*, 2017).

Plastic mulches are adopted on large scale in commercial vegetable production due to their large scale effects in gaining higher yield with better quality which might be due to decreased water evaporation, increased soil temperatures, less weed infestation (Coolong, 2010 and Gordon *et al.,* 2008). Black plastic mulch is effective in increasing soil temperature (Mahadeen, 2014) and thereby improved the yield of summer squash by 74% over control (Bhatt *et al.,* 2011) and transparent mulch helps in soil solarisation by increasing soil temperature that lead to yield gain of 25-28% in melon crop over control (Patil *et al.*, 2013; Ekinci and Dursun, 2009). Sunlight can pass through the transparent mulch so weeds can grow under them and need to be controlled by spraying suitable herbicide before applying mulching (Anonymous, 2011). On the other hand, organic mulches when applied to soil in thick layer increase the moisture content and reduce the weed population but when it is used in vegetable crops during warm season, it shows the adverse effects on growth and yield (Coolong, 2012). So, pertaining to the need of popularizing the summer squash cultivation due to its better nutrient composition and important vegetable source, present investigations were planned and carried out with the objectives of evaluating the impact of different mulch materials on growth and yield of summer squash and to assess the varietal performance under different mulch regimes.

Materials and Methods

The experiment conducted during March – June, 2017 at Agriculture Experimental Farm, Lovely Professional University, Phagwara, Punjab which geographically lies at latitude of 31.25ºN and longitude of 75.70ºE, 234 m above mean sea level. The experiment consisted of five mulch treatments viz., black plastic mulch (M_1), blue plastic mulch (M_2), rice straw mulch (M_3), transparent mulch (M_4) and control (M_5) and four varieties viz., Arpit (V_1), Surya (V_2), Pratap (V_3) and Desi (V_4), making the total of twenty treatment combinations. The experiment was conducted in split plot design where mulch materials were assisted in main plots, whilethe varieties were allocated in sub plots. The 20 treatment combinations were replicated thrice making the total of 60 plots with plot size of 3m X 1 m. The seeds were sown on 23rd march, 2017 at spacing of 90 cm X 60 cm following the recommended cultural practices of Punjab Agriculture University, Ludhiana. Observations were recorded for various growth, yield and quality parameters and subjected to analysis of variance (ANOVA) using split plot design as described by Gomez and Gomez (1984) keeping mulch materials as main plot and varieties as sub-plotusing analysis software, OPSTAT.

Results and Discussion

The findings of the present study indicated that different types of mulching materials had significant results on the vegetative growth parameters of summer squash viz., emergence percentage, plant height and number of leaves per plant. Among different mulch treatments, M_4 (Transparent Mulch) resulted in maximum emergence (83.33%), While the plant height (138.22 cm) and number of leaves per plant (100.42) were recorded highest in M_1 (Black Plastic Mulch). All the growth parameters are superior under black plastic mulch except emergence percentage that is highest under M_4 (Transparent Mulch) but found to be statistically at par with M_1 (Black Plastic Mulch) (79.12%) and M_2 (Blue Plastic Mulch) (72.22%), whereas all the growth parameters were recorded lowest in M_5 (Control). This might be due to the plants grown under plastic mulch experienced higher soil temperature,

warmer microclimate and weed free environment as compared to straw mulch and control, which resulted in higher growth of plants. Plastic mulches hinder the evaporation and moderate the soil temperature and moisture conditions that helps in better root development and nutrient uptake by plant that ultimately improves the plant growth. The findings of present study are in close agreement with the findings of Khan *et al.*, (2015) in sponge gourd and Bhatt *et al.*, (2011) in summer squash.

Among the varieties, emergence percentage (81.11%) and plant height (122.94 cm) were found to be superior in V_2 (Surya), while number of leaves per plant (92.20) were recorded maximum in V_1 (Arpit). Whereas emergence percentage (68.66%), plant height (118.31 cm) and number of leaves per plant (86.40) in were lowest in V_4 (Desi). The difference in growth parameters might be due to the differential capacity to absorb nutrients and difference in photosynthetic efficiency of the different varieties that could be attributed to their genetic makeup. These results are in close conformity with the results obtained by Al-Rawahi *et al.*, (2011) in cucumber and Andino and Motsenbocker (2004) in watermelon.

The interaction effect of mulch materials and varieties showed non- significant results for emergence percentage whereas for plant height and number of leaves per plant, results were significant. Highest emergence percentage (94.44%) was recorded in M_4V_2 (Transparent Mulch + Surya variety); plant height (146.02 cm) and number of leaves per plant (113.33) were recorded highest in M_1V_2 (Black Plastic Mulch + Surya variety). These results might be due to the warmer soil microclimate, available moisture, less weed infestation under the plastic mulches than control combined with better genetic potential of Surya variety (V_2) than others which replicated in to optimum conditions for better plant growth, as stated by of Alenazi *et al.*, (2015) in muskmelon and Andino and Motsenbocker (2004) in watermelon.

Mulching materials had also shown significant results for various yield parameters. M_1 (Black Plastic Mulch) took the least number of days taken for first harvesting (41.50 days from sowing) and provided the highest results for number of fruits per plant (37.36), average fruit weight (95.82 g), yield per plant (3.58 kg plant^{-1}), yield per hectare (32.36 t ha^{-1}) and number of harvests (17.58) and the inferior results were obtained from the control for all these parameters. The results obtained from present investigation might be due to the effect of improved soil microclimate, weed free environment, low evaporation and higher moisture availability in root zone that helped in better nutrient uptake by plant resulting in early and better vegetative growth which then enhanced the photosynthesis rate and translocation of synthesized food from leaves to fruits, resulted in early harvesting and increased number of fruits per plant under black plastic mulch. These results are in close agreement with findings of Webber *et al.*, (2017) and Bhatt *et al.*, (2011) in summer squash; Khan *et al.*, (2015) in sponge gourd.

Among the varieties V_2 (Surya) showed the significant results for the yield parameters and took minimum days to first harvesting (43.27 days) and resulted in highest values for no. of fruits per plant (31.13), average fruit weight (93.70 g), yield per plant (2.94 kg plant^{-1}), yield per hectare (26.48 t ha^{-1}) and number of harvests (14.80). V_4 (Desi) showed the poor performance for all the yield parameters except average fruit weight which was found lowest in V_3 (Pratap). These results might be due to the superiority of Surya variety in vegetative growth parameters which contributed to enhance yield parameters subsequently.

Table.1 Effect of Mulch Materials on Growth and Yield of Summer Squash

Mulching Material	Emergence Percentage	Plant Height (cm)	No. of Leaves per plant	Days Taken for First Harvesting	No. of Fruits per Plant	Average Fruit Weight (g.)	Yield per Plant (kg)	Fruit Yield (t ha^{-1})	No. of Harvests	TSS (^{0}Brix)
M_1	79.17	138.22	100.42	41.50	37.36	95.82	3.58	32.26	17.58	3.83
M_2	72.22	135.30	90.67	42.75	32.42	94.81	3.07	27.67	15.42	3.58
M_3	68.06	105.25	79.50	49.17	25.28	85.02	2.15	19.37	11.67	3.42
M_4	83.33	129.30	96.25	42.33	28.58	93.83	2.68	24.13	13.67	3.33
M_5	61.11	98.71	76.75	51.75	23.58	81.39	1.92	17.28	10.33	2.75
S.E. (m.)±	**3.20**	**0.75**	**1.21**	**0.69**	**0.25**	**0.42**	**0.02**	**0.15**	**0.22**	**0.21**
C.D. at 5%	**7.49**	**1.75**	**2.84**	**1.61**	**0.58**	**0.98**	**0.04**	**0.35**	**0.52**	**0.48**

M_1: Black Plastic Mulch, M_2: Blue Plastic Mulch, M_3: Rice Straw Mulch, M_4: Transparent Mulch, M_5: Control.

Table.2 Effect of Varieties on Growth and Yield of Summer Squash

Variety	Emergence Percentage	Plant Height (cm)	No. of Leaves per plant	Days Taken for First Harvesting	No. of Fruits per Plant	Average Fruit Weight (g.)	Yield per Plant (kg)	Fruit Yield (t ha^{-1})	No. of Harvests	TSS (^{0}Brix)
V_1	72.22	122.02	90.20	45.80	29.40	89.81	2.66	23.92	13.73	3.33
V_2	81.11	122.94	89.60	43.27	31.13	93.70	2.94	26.48	14.8	3.33
V_3	71.11	122.15	88.67	46.20	29.31	88.31	2.62	23.60	13.53	3.07
V_4	66.68	118.31	86.40	46.73	27.93	88.88	2.51	22.57	12.87	3.80
S.E. (m.)±	**4.06**	**0.50**	**0.74**	**0.66**	**0.19**	**0.37**	**0.02**	**0.18**	**0.22**	**0.21**
C.D. at 5%	**8.33**	**1.02**	**1.52**	**1.36**	**0.40**	**0.76**	**0.04**	**0.36**	**0.44**	**0.44**

V_1: Arpit, V_2: Surya, V_3: Pratap, V_4: Desi.

Table.3 Effect of Mulch Materials and Variety on Growth and Yield of Summer Squash

Treatment	Emergence Percentage	Plant Height (cm)	No. of Leaves per plant	Days Taken for First Harvesting	No. of Fruits per Plant	Average Fruit Weight (g.)	Yield per Plant (kg)	Fruit Yield (t ha^{-1})	No. of Harvests	TSS (^{0}Brix)
M_1V_1	77.78	136.54	95.67	42.00	36.11	94.83	3.43	30.84	17.33	3.67
M_1V_2	88.89	146.12	113.33	40.67	40.22	98.1	3.95	35.52	19.33	4.33
M_1V_3	72.22	136.42	98.67	41.33	37.78	96.66	3.65	32.88	17.67	2.67
M_1V_4	77.78	133.8	94.00	42.00	35.33	93.69	3.31	29.79	16.00	4.67
M_2V_1	72.22	134.21	90.00	42.67	31.11	93.92	2.92	26.28	15.00	2.33
M_2V_2	77.78	140.46	101.33	41.33	34.44	97.68	3.63	30.27	16.67	3.67
M_2V_3	72.22	135.03	83.67	44.00	32.11	93.94	3.02	27.15	15.67	4.00
M_2V_4	66.67	131.5	87.67	43.00	32.00	93.68	3.00	26.97	14.33	4.33
M_3V_1	66.67	109.49	82.33	49.33	26.22	85.97	2.26	20.31	12.00	4.00
M_3V_2	77.77	102.8	68.33	46.00	26.78	89.86	2.41	21.69	12.67	2.67
M_3V_3	66.67	110.43	96.33	49.33	25.22	79.64	2.01	18.06	11.33	3.67
M_3V_4	61.11	98.27	71.00	52.00	22.89	84.62	1.94	17.43	10.67	3.33
M_4V_1	83.33	131.34	102.67	43.00	29.78	90.37	2.69	24.21	13.67	4.33
M_4V2	94.44	125.26	93.33	41.33	29.78	98.11	2.92	26.28	14.67	3.00
M_4V_3	83.33	131.38	90.33	43.00	28.22	92.21	2.60	23.4	13.00	2.33
M_4V_4	72.22	129.22	98.67	42.00	26.56	94.62	2.51	22.62	13.33	3.67
M_5V_1	61.11	98.53	80.33	52.00	23.78	83.93	1.99	17.94	10.67	2.33
M_5V_2	66.67	100.05	71.67	47.00	24.44	84.73	2.07	18.63	10.67	3.00
M_5V_3	61.11	97.48	74.33	53.33	23.22	79.11	1.84	16.53	10.00	2.67
M_5V_4	55.56	98.76	80.67	54.67	22.89	77.79	1.78	16.02	10.00	3.00
S.E. (m.)±	**6.00**	**0.86**	**1.33**	**1.03**	**0.32**	**0.59**	**0.03**	**0.27**	**0.47**	**0.33**
C.D. at5%	**NS**	**2.63**	**4.08**	**NS**	**0.96**	**1.77**	**0.09**	**0.79**	**1.00**	**0.98**

Similar observations were recorded by Keerthika *et al.,* (2016) in cucumber; Sithole *et al.,* (2015) in bottle gourd and Ashwini (2014) in snake gourd.

The interaction effect of mulch materials and varieties resulted in non-significant findings for the days taken to first harvesting, while the other yield parameters viz., number of fruits per plant, average fruit weight, yield per plant, yield ha^{-1} and total number of harvests showed significant results. Number of fruits per plant (40.22), yield per plant (3.95 kg $plant^{-1}$), yield per hectare (35.52 t ha^{-1}) and total number of harvests (19.33) were found to be best in M_1V_2 (BlackPlastic Mulch + Surya variety) and the average fruit weight (98.11 g) was maximum in M_4V_2 (Transparent Mulch + Surya variety) followed by M_1V_2 (Black Plastic Mulch + Surya variety) (98.10 g). All these parameters showed the inferior results in M_5V_4 (Control + Desi variety). Increase in vegetative growth of plant associated with increased rate of photosynthesis activity had a great impact on yield per plant. Similar observations were also recorded by Alenazi *et al.,* (2015) and Ekinci and Dursun (2009) in melon. Mulch materials, varieties and their interaction showed the significant results for total soluble solids (TSS). Among the mulch materials M_1 (Black Plastic Mulch) (3.83^{0}Brix), among the

varieties V_4 (Desi) (3.80^0Brix) and among interaction M_1V_4 (Black Plastic Mulch + Desi Variety) (4.67^0Brix) resulted in highest TSS content. These results are close confirmation with the findings of Parmar *et al.*, (2013) in watermelon; Ekinci and Dursun (2009) and Deoraoji and Chandrashekhar (2003) in musk melon.

From the present results it can be concluded that plastic mulches have positive effects on growth and yield in summer squash where black plastichas more pronounced effects in comparison to other mulch materials so can be recommended on commercial basis in the region where study was conducted (Doaba region of Punjab). Among varieties, Surya variety with its better performance than other varieties can be suggested for commercial cultivation. Hence for enhancing commercial cultivation of summer squash with better yield and quality 'Surya' variety should be grown under black plastic mulch.

References

Alenazi, M., Abdel-Razzak, H., Ibrahim, A., Wahb-Allah, M. and Alsadon, A. 2015. Response of muskmelon cultivars to plastic mulch and irrigation regimes under greenhouse conditions. *J. Anim. Plant Sci*. 25(5): 1398-1410.

Al-Rawahi, M., Al-Said, F.A., Khan, I.A. and Al-Khanjary, S. 2011. Diversity of cucumber accessions in Oman. *Int. J. Environ. Agric. Res.* 13(4): 505-510.

Andino, J.R. and Motsenbocker, C.E. 2004. Colored plastic mulches influence cucumber beetle population s, vine growth, and yield of watermelon.*HortScience*.39 (6): 1246-49.

Anonymous. 2011. www.ncpahindia.com

Anonymous. 2016. http://www.fao.org/faostat/en/#home

Ashwini, K. 2014. Studies on the performance of F1 hybrids and their parents in snake gourd (*Trichosanthes anguina* L.) for yield and yield attributing characters. http:// krishikosh.egranth.ac.in/handle/1/69482 .

Bhatt, L., Rana, R., Uniyal, S.P. and Singh, V.P. 2011. Effect of mulch materials on vegetative characters, yield and economics of summer squash (*Cucurbita pepo*) under rainfed mid - hill condition of Uttarakhand. *Vegetable Science*. 38(2): 165-168.

Bobby, A., Prashanth, P., Seenivasan, N. and Mishra, P. 2017. Effect of Different Mulch Materials on Weed Control in Cucumber (*Cucumis sativus* L.) Hybrid "Multistar" Under Shade Net Conditions. *Int. J. Pure Appl. Biosci.* 5(5): 1246-1251.

Coolong, T. 2010. Performance of paper mulches using a mechanical plastic layer and water wheel transplanter for the production of summer squash. *HortTechnology*. 20(2): 319-324.

Coolong, T. 2012. *Mulches for Weed Management in Vegetable Production, Weed Control*, Dr. Andrew Price (Ed.). pp. 57-73.

Dhaliwal, M.S. 2012. Handbook of Vegetable Crops. 2nd revised edition. New Delhi: Kalyani Publishers. P 116-17.

Ekinci, M. and Dursun, A. 2009. Effects of different mulch materials on plant Growth, some quality parameters and yield in Melon (*Cucumis melo* L.) Cultivars in high altitude environmental condition. *Pak J Bot.* 41(4): 1891-1901.

Gomez, L.A. and Gomez, A.A. 1984. Statistical procedure for agricultural research. 3rd edition. Singapore: John Wiley and Sons. 680 p.

Gordon, G.G., Foshee, W.G., Reed, S.T., Brown, J.E., Vinson, E. and Woods, F.M. 2008. Plastic Mulches and Row

Covers on Growth and Production of Summer Squash. *Int. J.Veg. Sci*. 14(4): 322-338.

Keerthika, T., Devaki, C.S., Suma, F. and Urooj, A. 2016. Studies on the nutritional and quality characteristics of *Cucumis sativus* varieties. *Agric. Sci. Res. J*. 6(4): 79-85.

Khan, S., Pal, M. and Kumar, V. 2015. Influence of different mulches on growth and yield of sponge gourd (*Luffa clyndrica* L.). *Plant Archives.* 15(1): 393-395.

Mahadeen A.Y. 2014. Effect of polyethylene black plastic mulch on growth and yield of two summer vegetable crops under rain-fed conditions under semi-arid region conditions. *Amer. J. Agric. Biol. Sci*. 9(2): 202-207.

Parmar, H.N., Polara, N.D. and Viradiya, R.R. 2013. Effect of mulching material on growth, yield and quality of watermelon (*Citrullus lanatus* thunb) cv. Kiran. *Univers. J. Agric. Res.* 1(2): 30-37.

Patil, S.S., Kelkar, T.S. and Bhalerao, S.A. 2013. Mulching: A soil and water conservation practice. *Res. J. Agric. Forest. Sci.* 1(3): 26-29.

Sarhan, T.Z., Mohammed, G.H. and Teli, J.A. 2011. Effect of bio and organic fertilizers on growth, yield and fruit quality of summer squash. *Sarhad J. Agric*. 27(3): 377-383.

Sithole, N.J., Modi, A.T. and Mabhaudhi, T. 2015. Seed quality of selected bottle gourd landraces compared with popular cucurbits. *S. Afr. J. Plant & Soil*. 33(2): 133-139.

Webber, C.L., White Jr, P.M., Spaunhorst, D.J. and Petrie, E.C. 2017. Comparative Performance of Sugarcane Bagasse and Black Polyethylene as Mulch for Squash (*Cucurbita pepo* L.) Production. *J. Agric. Sci.* 9(11): 1-9.

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