

Effect of organic and inorganic mulching on growth, yield and economics of summer squash (*Cucurbita pepo* L.) in open field condition of mid hills of Uttarakhand

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Abstract

In order to find out the effect of organic and inorganic mulch viz. locally available fern leaves and black plastic on growth, yield and economics of summer squash (Cucurbita pepo L.), the field experiment were under taken during spring summer season of 2018 and 2019 in open field condition of mid hills of Uttarakhand. Summer squash was mulched with locally available fern leaves along with the thickness of 3-4 cm and 25µ black polyethylene and the mulching treatments were compared with un-mulched i.e. control. The experiment was laid out in randomized block design with four replications. During the investigation, observations on plant height, plant spread, collar diameter, number of leaves/plant, number of fruits/plant, days to first harvest, number of harvesting, yield per plant (Kg), total yield (t/ha) etc. were recorded. In addition, to assess the profitability of treatments cost of cultivation, net profit and benefit cost ratio were also worked out. The maximum plant height (44.74 cm), plant spread (119.36 cm), collar diameter (1.97 cm), number of fruits per plant (6.98), days to first harvest (45.35), number of harvesting (8.18), yield per plant (5.87 kg) and total yield (58.12 t/ha) were recorded in black plastic mulch which compared with other treatments. The black plastic mulch not only advanced the harvesting time but also produced 48.45 per cent higher yield than the control. Mulching with black plastic in summer squash was also found most economical with net return of Rs. 4,78,056.00 ha⁻¹ and Benefit : Cost ratio of 3.17. While, locally available organic mulch i.e. fern leaves was found equally good in yield (50.11t/ha) and economic net return of Rs. 4,01,455.00, beside eco-friendly too. Based on overall performance, it could be conducted that in open field condition of mid hills of Uttarakhand, black plastic mulch in summer squash is the best and most economical treatment, hence, recommended for commercial cultivation at farmers fields, provide all other scientific management and package of practices are followed.

Key words: Summer squash, organic and inorganic mulching, black plastic mulch, open field condition, mid hills, economics, Uttarakhand.

Introduction

Summer squash (*Cucurbita pepo* L.) receives its name due to the fruit being harvested and consume in the summer; it is also known as Bush squash, Vegetable marrow, Chappan Kaddu, Vilayati Kaddu in different parts of the country (Thamburaj and Singh, 2001). Summer squash has a great production potential

under mid hills climatic condition during spring summer, the sowing season starts from last week of February to March and the crop matures in June-July. It performs well in cool and moist climatic condition and requires approximately 16-27°C temperature for its growth and development. Mid hills of Uttarakhand has a great potential for this vegetable due to easier cultivation, short duration and off season nature of the crop with higher economic return per unit area under small and scattered land holdings, thus attracting

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number of vegetable growers towards its cultivation in hills of Uttarakhand.

The use of organic and inorganic mulches has been observed to have important role in vegetable production, particularly in open field conditions. These not only conserved the soil moisture, but along with regulation of soil temperature also suppress the weed population which ultimately helps in increasing the early and total yield. The yield increase in squash has been found to the tune of 30 per cent (Annda *et al.*, 2008). Reduction in labour requirement and drudgery is the additional advantage of mulch in stress prone hilly conditions of Uttarakhand as crop raising is labour intensive due to lack of mechanization in hill horticulture (Singh and Singh 2010). Considering the advantages of mulching in vegetable production and keeping in view the open field condition, an investigation was undertaken to study the effect of organic and inorganic mulch on growth, yield and economics of summer squash.

Materials and Methods

The experiment was conducted at Krishi Vigyan Kendra, Jakhdar, Rudraprayag (30° N Latitude, 78° E Longitude and Altitude 1750 m above MSL) during the spring summer season of 2018 and 2019 on summer squash variety Zucchini with organic and inorganic mulches viz., Fern leaves and black polyethylene in open field condition. The mulching treatments were compared with un-mulched control. The experiment was laid out in randomized block design with four replications.

The soil of the experimental area was sandy loam in texture, slightly acidic in nature with a pH of 6.2 with available carbon of 6.15%. At the time of land preparation, 10kg FYM per m² was mixed by tilling in the top (15cm) soil, one day before transplanting and all the recommended cultural practices were carried throughout the growing season. The seeds of summer squash were sown in Coco peat: Sand: Garden soil (2:1:1) media inside the propagation tray at depth of half to one inch on 27 February during both the year of experiments under polyhouse. The daily mean temperature and relative humidity inside the polyhouse ranged from 15.5°C to 24°C and 34-68%, respectively during nursery raising. One month old seedlings were transplanted on 1.0 m wide and 15 cm raised beds in a row of 0.75 m plant to plant spacing in the plot size of 6.0 m x 2.9 m. The plastic used for the mulching was of 25µ. The control treatment was without mulch, a

traditional practice followed by the farmers; however the thickness of organic mulch i.e. fern leaves (*Athyrium pectinatum*) on next days of transplanting was maintained as 3-4 cm.

Observations on plant growth and yield parameters were recorded on three randomly selected plants in each replication by using standard techniques in summer squash. The observations pertaining to different parameter of growth and yield were recorded time to time, while the fruits were harvested when attained a weight of 750 to 1000 gm. The economics of summer squash was calculated taking consideration of all inputs and operational cost as well as wages of labours incurred since seed sowing for nursery raising to final harvesting including transportation and marketing. The gross and net returns were worked out accordingly by taking cost of production and average sale price of fruits (Rs. 12.00/kg). The mean data of each replication were analyzed statistically in a randomized block design with four replications as suggested by Panse and Sukhatme (1989) and pooled data were presented in Tables.

Results and Discussion

Black plastic mulch has significantly influenced the plant growth parameters viz., plant height, collar diameter, plant spread and number of leaves/plant when compared with locally available organic mulches and un-mulched control. Plant mulched with black plastic (T₁) recorded a maximum plant height (44.74 cm), plant spread (119.36 cm) and collar diameter (1.97 cm), which were significantly superior over all other treatments under investigation for these characters. The effect of organic mulch in respect of plant height, collar diameter and plant spread were also found superior over un-mulched plants (T₃). The maximum number of leaves per plant (40.14) was noted with black plastic mulch (T₂) followed by organic mulch (38.04) with no significant differences among these while minimum (37.09) was observed in Un-mulched/control (Table 1).

Improvement in growth characters as a result of mulches might be due to enhancement in photosynthesis and other metabolic activities. Higher soil temperature under black plastic mulch improves the plant microclimate led to early growth and development which advanced the flowering and fruiting. Similar kind of observations with respect to plant growth parameters were also reported by (Bhatt *et al.*, 2011) in summer squash. They were of view

Table 1: Effect of mulching on growth parameters of summer squash (*Cucurbita pepo* L.) in open field condition of mid hills of Uttarakhand

Treatments	Plant height (cm)	Plant spread (cm)	Collar diameter (cm)	Number of leaves/plant
T ₁ : Organic mulch	40.88	110.98	2.04	38.04
T ₂ : Inorganic mulch	44.74	119.36	1.97	40.14
T ₃ : Un-mulched/Control	37.73	106.14	1.75	37.09
CD at 5%	2.872	9.167	0.114	N/A
SEmean ±	0.814	2.599	0.032	0.957

Table 2: Effect of mulching on yield and yield attributes of summer squash (*Cucurbita pepo* L.) in open field condition of mid hills of Uttarakhand

Treatments	No. of Fruits/ Plant	Days to first harvest	Number of fruit harvesting	Yield per plant (Kg)	Total yield (t/ha)	% increase in yield over control
T ₁ : Organic mulch	5.85	47.07	7.15	4.86	50.11	27.99
T ₂ : Inorganic mulch	6.98	45.35	8.18	5.87	58.12	48.45
T ₃ : Un-mulched/Control	5.08	55.01	5.92	3.90	39.15	-
CD at 5%	1.051	4.254	0.802	0.420	8.151	-
SEmean ±	0.298	1.206	0.227	0.119	2.311	-

that plastic mulch improves the CO₂ availability in the plant which ultimately led to higher rate of photosynthesis due to chimney effect. Black plastic mulch has an additional advantage that the absence of light within it did not allow photosynthesis under the film and therefore weed growth was depressed.

Mulching had also shown significant influence on number of fruits per plant, days to first harvest, number of fruit harvesting, yield per plant and total yield (Table 2). It was black plastic mulch (T₂) which gave the maximum number of fruits per plant (6.98), number of harvesting (8.18), yield per plant (5.87 kg) and total yield (58.12 t/ha). The number of harvesting of fruits in organic mulched plots (7.15) was also higher than the un-mulched plots (5.93). Similar to harvest number, the black plastic mulching had also given significantly higher early 45.35 days to first harvest as compared to organic mulch (47.07 days) and un-mulched (55.01 days). Black plastic mulch plots had given as much as 48.45 per cent higher yield than un-mulched plots, while mulching with fern leave gives 27.99 per cent more yield in compare to control (T₃). Similar kinds of observation were reported by Nimah (2007) in cucumber and Singh *et al.*, (2015) in summer squash. The yield increase under organic mulch could

be due to their ability to reduce soil temperature fluctuation increased water holding capacity, smothering weed population which led to favorable condition for plant growth and development. The positive influence of organic mulch on yield was also reported by Singh *et al.*, (2015) and Thapliyal *et al.*, (2014) in summer squash.

The data presented in Table 3 indicated that mulching with black plastic (T₂) in summer squash is most profitable, giving highest gross return ¹ 6,97,440.00, net return ¹ 4,78,056.00 and Benefit : Cost ratio 3.17 in comparison to organic mulch (T₁) which also found profitable in respect to net return¹ 4,01,455.00 and Benefit : Cost ratio 3.00 followed by control treatment (T₃) has given net return ¹ 2,80,510.00 and Benefit : Cost ratio of 2.48, respectively. Similar findings were also reported by Pandey *et al.*, (2018) and Singh *et al.*, (2015). The increase in gross and net return and Benefit: Cost ratios under organic (T₁) and inorganic (T₂) mulches were mainly due to higher early and total yield in comparing to control (T₃). These findings are in agreement with those reported by Bhatt *et al.*, (2016) and (Bhatt *et al.*, 2011).

Table 3: Effect of mulching on economics of summer squash (*Cucurbita pepo* L.) in open field condition of mid hills of Uttarakhand

Treatments	Cost of cultivation (Rs/ha)	Gross return (Rs/ha)	Net return (Rs/ha)	B:C ratio
T ₁ : Organic mulch	199865	601320	401455	3.00
T ₂ : Inorganic mulch	219384	697440	478056	3.17
T ₃ : Un-mulched/Control	189290	469800	280510	2.48

Based on the study, it could be concluded that use of black plastic mulch in summer squash is the most profitable mulch material under open field condition of mid hills of Uttarakhand. While, locally available organic mulch i.e. fern leaves was found equally good in yield and economic return, beside eco-friendly too.

References

- Annda, A.; Venkatesha, M. M.; Kiran Kumar, K.C.; Krishnamurthy, N. and Bhanu Prakash, V. H. (2008). Mulching: an ideal approach for soil and water conservation in dry lands. *Rashtriya Krishi* 3(2): 128-129.
- Bhatt Lalit; Maurya, S. K. and Singh, D. (2016). Economic feasibility of summer squash cultivation using low tunnel and black plastic mulch under Tarai condition of Uttarakhand. *Journal of Applied and Natural Science*, 8(2):817-821.
- Bhatt Lalit; Rana, Renu; 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.
- Nimah, M. N. (2007). Cucumber yield under regular deficit irrigation and mulching treatments. *Acta Horticulture* (731): 189-194.
- Pandey, B. K.; Maurya, S. K.; Bhatt, L.; Pooja and Chauhan, D. S. (2018). Performance of summer squash (*Cucurbita pepo* L.) under protected condition in Tarai region of Uttarakhand. *Field Crop*, 1(2)
- Panse, V. G. and Sukhatme, P. (1989). *Statistical methods for Agricultural workers*, 3rd edition, pp 70-99. ICAR New Delhi.
- Singh, M.; Bhatt, L.; Singh, V. P.; Mourya, S. K. and Singh, A. K. (2015). Effect of transplanting date and mulching materials on growth, yield and economics of summer squash in Uttarakhand hills, *Indian Journal of Agricultural Science*. 12:1529-1533.
- Singh, P. K.; Maurya, S. K.; Singhal, P. and Joshi, G. (2010). Performance of Summer squash for off season cultivation under protected condition in tatali region of Uttarakhand, National Seminar on Protected Cultivation of Vegetable and Flower-A value chain approach (11-12 January, 2012; Pantnagar, India), Book of Abstract. pp-12.
- Singh, V. P. and Singh, P. K. (2010). Earliness and improved productivity in summer squash and tomato using plastic mulches through front line demonstration in mid-hills of Uttarakhand. (*In*) *National Symposium on Conservation Horticulture*, held at Dehradun during 21-23 March, pp 302-3.
- Singh, V. P.; Jeena, A. S. and Singh, P. K. (2008). Black polyethylene mulch for cultivation of off season vegetables in Uttarakhand hills. *Proceeding of National Workshop on Appropriate Technologies for Hills* (Oct. 16-18, 2008). pp. 357-359.
- Thamburaj, S. and Singh, N. (2001). *Textbook of vegetable, tuber crops and spices*, Indian Council of Agricultural Research, New Delhi, 286p.
- Thapliyal, P.; Bhatt, L.; Uniyal, S. P. and Mourya, S. K. (2014). Effect of soil, moisture regimes and mulch materials on growth, yield and economics of summer squash in Uttarakhand hills. *Vegetable Science*, 41(2): 184-187.