



ISSN Print: 2618-060X
 ISSN Online: 2618-0618
 NAAS Rating (2026): 5.20
 IJRA 2026; 9(9): 1112-1118
www.agronomyjournals.com
 Received: 16-07-2026
 Accepted: 17-08-2026
 Published: 26-09-2026

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Comparative effect of organic and synthetic mulches on growth, yield and productivity of tomato (*Solanum lycopersicum* L.) cv. Kashi Aman

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DOI: <https://www.doi.org/10.33545/2618060X.2026.v9.i9o.6656>

ABSTRACT

A field experiment was conducted during 2025-26 at the Instructional Farm, Khudmudi, College of Horticulture and Research Station, Sankara-Patan, Durg (Chhattisgarh) to study the comparative effect of organic and synthetic mulches on growth, yield and productivity of tomato (*Solanum lycopersicum* L.) cv. Kashi Aman. The experiment was laid out in a Randomized Block Design with twelve treatments, comprising eight organic mulches (paddy straw, saw dust, dry leaves, newspaper, dry grass, cardboard, wood chips and rice husk), three synthetic plastic mulches (red, black and transparent) and an unmulched control, replicated thrice. Among all the treatments, red plastic mulch (T_3) recorded the tallest plant height at 30, 60 and 90 days after transplanting (DAT) (28.11, 57.39 and 88.96 cm, respectively) and the maximum number of branches per plant (3.54, 7.23 and 10.52 at 30, 60 and 90 DAT, respectively), whereas the control (T_0) recorded the lowest values for both traits. For yield attributes, red plastic mulch recorded the earliest first fruit harvest (65.92 days), the highest average fruit weight (76.40 g), fruit diameter (5.63 cm polar and 5.81 cm radial) and the maximum fruit yield per plant (1.13 kg), per plot (16.95 kg) and per hectare (423.75q ha⁻¹). Black plastic mulch (T_1) and transparent plastic mulch (T_2) were statistically at par with red plastic mulch for most of these traits, whereas the unmulched control (T_0) recorded the poorest performance throughout. The findings conclude that synthetic plastic mulches, particularly red plastic mulch, are highly effective in enhancing vegetative growth and improving yield attributes of tomato as compared to organic mulches and the unmulched control.

Keywords: Tomato, *Solanum lycopersicum*, Mulching, Growth parameters, Yield attributes, Plastic mulch, Kashi Aman

1. Introduction

Tomato (*Solanum lycopersicum* L.) is one of the most important and widely cultivated vegetable crops in the world, valued for its nutritional richness and economic importance. It is a diploid plant with a somatic chromosome number of $2n = 2x = 24$ and belongs to the Solanaceae family (Thapa *et al.*, 2018) [1]. India ranks second globally in tomato area and production, occupying 0.854 million hectares with a yield of 21.32 million tonnes during 2023-2024 with Chhattisgarh contributing significantly to the national output and Durg district emerging as a leading producer within the state (Anonymous, 2024) [2]. Despite its high yield potential, tomato productivity remains strongly dependent on prevailing soil and microclimatic conditions during the growing period, since flowering behaviour and fruit development are highly sensitive to fluctuations in soil moisture and temperature.

Mulching is a widely adopted and cost-effective agronomic practice that modifies the soil microenvironment around the root zone by conserving moisture, moderating soil temperature, suppressing weeds and improving nutrient availability (Kader *et al.*, 2017) [3]. These changes influence not only vegetative growth but also the final yield of the crop. Organic materials such as paddy straw, dry leaves, saw dust and rice husk, as well as synthetic materials such as coloured polyethylene films (Shreerama *et al.*, 2025) [4] have been reported to differ considerably in their influence on crop performance, largely due to differences in their thermal and moisture-retention properties. Both organic and inorganic mulches improve tomato growth and yield by modifying the hydrothermal regime, enhancing water retention, infiltration, and reducing runoff (Bahadur *et al.*, 2013) [5]. The type and color of mulch can influence crop performance, making appropriate mulch selection important for better tomato growth and yield (Mendonça *et al.*, 2021) [6].

Since the response of tomato in terms of growth, and yield attributes varies with the type of mulching material used, the present investigation was undertaken with the specific objective of evaluating the impact of organic and synthetic mulches on the growth parameters and yield attributes of tomato cv. Kashi Aman under the agro-climatic conditions of Durg, Chhattisgarh.

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2. Materials and methods

The present investigation was conducted during 2025-26 at the Instructional Farm, Khudmudi, College of Horticulture and Research Station, Sankara-Patan, Durg (Chhattisgarh), situated at 21°07'07.3" N latitude and 81°34'41.3" E longitude at an altitude of 311 m above mean sea level. Healthy 25-30 day old seedlings of tomato cv. Kashi Aman were transplanted at a spacing of 60×45 cm.

2.1 Experimental design and treatments

The experiment was laid out in a Randomized Block Design (RBD) with twelve treatments replicated thrice. The treatments comprised: T₀-Control (no mulch), T₁-Black plastic mulch, T₂-Transparent plastic mulch, T₃ - Red plastic mulch, T₄ - Paddy straw, T₅ - Saw dust, T₆ - Dry leaves, T₇ - Newspaper, T₈ -Dry grass, T₉ -Cardboard, T₁₀ - Wood chips, and T₁₁ - Rice husk. Organic mulch materials were spread evenly around the base of the plants, where as synthetic mulch sheets were laid over the beds prior to transplanting, with small openings cut to accommodate the seedlings.

2.2 Observations recorded

2.2.1 Growth parameters

Plant height (cm): measured from the base to the top of the shoot tip using a meter scale at 30, 60 and 90 days after transplanting (DAT) and expressed in centimeters.

Number of branches per plant: total number of branches arising from the main stem, counted on five randomly tagged plants at 30, 60 and 90 DAT.

2.2.2 Yield attributes

- **Days to first fruit harvest:** Number of days from transplanting to the date when at least one ripe fruit was harvested.
- **Average fruit weight (g):** Mean weight of five randomly selected marketable fruits per plot, recorded on a digital balance.
- **Average fruit diameter-Polar and Radial (cm):** Measured with a digital vernier caliper on the same sample of fruits.
- **Fruit yield per plant (kg):** Total weight of fruits harvested from a plant, pooled overall pickings.
- **Fruit yield per plot (kg):** Total weight of fruits harvested from a plot, pooled overall pickings.
- **Fruit yield (qha⁻¹):** Computed from plot yield and net plot area, expressed in quintals per hectare.

2.3 Statistical analysis

The data recorded on growth and yield attributes were statistically analysed following the analysis of variance (ANOVA) technique applicable to a Randomized Block Design. Treatment means were compared using the critical difference (CD) at 5 percent level of significance.

3. Results and discussion

3.1 Growth parameters

3.1.1 Plant height (cm)

Plant height was significantly influenced by different mulching treatments at 30, 60 and 90 DAT (Table 1 and Graph 1). At 30 DAT, the tallest plants were recorded under red plastic mulch (T₃, 28.11 cm), statistically at par with black plastic mulch (T₁, 27.53 cm), transparent plastic mulch (T₂, 27.08 cm), paddy straw (T₄, 26.62 cm) and rice husk (T₁₁, 25.89 cm), whereas the shortest plants were observed under the control (T₀, 16.40 cm). At 60 DAT, red plastic mulch (T₃) again recorded the tallest plant height (57.39 cm), at par with black plastic mulch (T₁, 55.26 cm) and transparent plastic mulch (T₂, 54.27 cm), while the control (T₀) recorded the shortest plants (44.64 cm). At 90 DAT, the tallest plant height was observed under red plastic mulch (T₃, 88.96 cm), remaining at par with black plastic mulch (T₁, 85.37 cm) and transparent plastic mulch (T₂, 82.64 cm), whereas the control (T₀) recorded the shortest plants (71.51 cm). The superior plant height under red plastic mulch may be attributed to its ability to create a favourable soil microenvironment by conserving soil moisture, increasing root-zone temperature, suppressing weed growth and improving nutrient availability and uptake, whereas the poor performance under the control may be due to greater evaporation losses, weed competition and fluctuating soil temperatures (Lamont, 2005) [7]. Similar results also found by (Agarwal *et al.*, 2024) [8] and (Nikolić *et al.*, 2012) [9], who also recorded the tallest plants under red plastic mulch.

3.1.2 Number of branches per plant

The number of branches per plant was also significantly influenced by mulching treatments at all growth stages (Table 1 and graph 2). At 30 DAT, the highest number of branches was recorded under red plastic mulch (T₃, 3.54), at par with black plastic mulch (T₁, 3.42) and transparent plastic mulch (T₂, 3.29), while the control (T₀) recorded the minimum value (2.45). At 60 DAT, red plastic mulch (T₃) produced the maximum number of branches (7.23), at par with black plastic mulch (T₁, 6.87) and transparent plastic mulch (T₂, 6.74), whereas the lowest number of branches was recorded under the control (T₀, 4.14). At 90 DAT, red plastic mulch (T₃) recorded the highest number of branches per plant (10.52), at par with black plastic mulch (T₁, 10.14) and transparent plastic mulch (T₂, 9.87), while the control (T₀) produced the minimum number of branches (7.34). The increased branching under plastic mulches may be attributed to a favourable soil microenvironment through improved moisture conservation, optimum soil temperature, reduced evaporation, enhanced nutrient availability and effective weed suppression, which promoted vigorous root growth and greater nutrient uptake, stimulating lateral branch development. The findings are in accordance with the results obtained by (Agrawal *et al.*, 2010) [10] who recorded the highest number of primary branches under red mulch and (Pinder *et al.*, 2016) [11] also reported better branching under plastic mulch compared with un-mulched conditions.

Table 1. Effect of different mulching materials on growth parameters of tomato

Tr. No.	Treatment details	Plant height (cm)			No. of branches per plant		
		30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT
T ₀	Control	16.40	44.64	71.51	2.45	4.14	7.34
T ₁	Black plastic mulch	27.53	55.26	85.37	3.42	6.87	10.14
T ₂	Transparent plastic mulch	27.08	54.27	82.64	3.29	6.74	9.87
T ₃	Red plastic mulch	28.11	57.39	88.96	3.54	7.23	10.52
T ₄	Paddy straw	26.62	51.84	80.47	3.14	6.28	9.43
T ₅	Sawdust	19.82	50.39	77.86	2.68	5.46	7.63
T ₆	Dry leaves	23.64	51.57	79.35	2.92	5.83	8.89
T ₇	Newspaper	22.91	51.28	78.88	2.88	5.57	8.61

(continued on next page)

Tr. No.	Treatment details	Plant height (cm)			No. of branches per plant		
		30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT
T ₈	Dry grass	24.37	51.68	79.50	2.98	5.79	9.16
T ₉	Cardboard	22.18	50.96	78.70	2.82	5.18	8.43
T ₁₀	Woodchips	21.45	50.72	78.49	2.75	4.88	8.12
T ₁₁	Rice husk	25.89	51.79	80.36	3.00	5.62	9.28
	SE(m)±	0.81	1.57	2.41	0.09	0.18	0.27
	CD at 5%	2.37	4.61	7.07	0.27	0.53	0.80

3.2 Yield attributes

3.2.1 Days to first fruit harvest

The minimum days to first fruit harvest were recorded under red plastic mulch (65.92 days), statistically at par with black plastic mulch (67.17 days), transparent plastic mulch (68.33 days), paddy straw (69.26 days), rice husk (69.45 days) and dry grass (71.48 days). The control required the maximum time (77.44 days) (Table 2 and Graph 3). Earlier harvesting under plastic mulch resulted from accelerated flowering and improved fruit growth due to increased soil temperature, which contributed to better absorption and translocation of minerals through the root system. Similar results were reported by (Singh *et al.*, 2017) [12].

3.2.2 Average fruit weight (g)

The highest average fruit weight was recorded under red plastic mulch (76.40 g), statistically at par with black plastic mulch (72.65 g) and transparent plastic mulch (70.80 g), whereas the lowest fruit weight (47.92 g) was observed under the control (Table 2 and Graph 4). Higher fruit weight under plastic mulch resulted from efficient translocation of photosynthates, better nutrient absorption and prolonged fruit-filling duration. Similar results were reported by (Nikolić *et al.*, 2012) [9] and (Rao *et al.*, 2016) [13].

3.2.3 Average fruit diameter-polar and radial (cm)

The maximum polar fruit diameter (5.63 cm) and radial diameter (5.81 cm) were recorded under red plastic mulch, at par with black plastic mulch (5.33 cm polar, 5.69 cm radial), paddy straw (5.31 cm

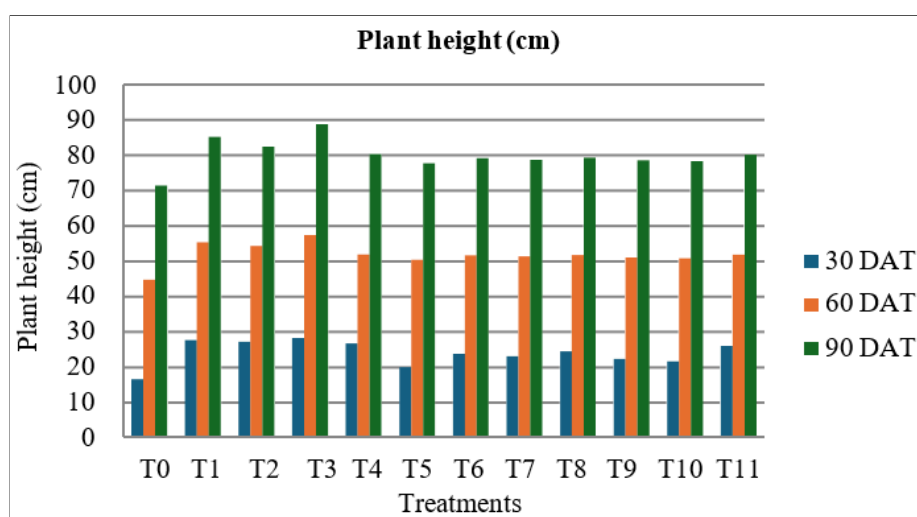
polar, 5.68 cm radial) and transparent plastic mulch (5.21 cm polar, 5.56 cm radial), whereas the minimum values (3.73 cm polar and 4.43 cm radial) were observed under the control (Tables 2 and Graph 5). The improved fruit diameter may be attributed to better water availability and nutrient uptake, which enhanced cell enlargement and fruit development. Similar observations were reported by (Agrawal *et al.*, 2010) [10] and (Nikolić *et al.*, 2012) [9].

3.2.4 Fruit yield per plant (kg)

The highest fruit yield per plant was obtained under red plastic mulch (1.13 kg), at par with black plastic mulch (1.07 kg), whereas the lowest yield (0.62 kg) was recorded under the control (Table 12 and Graph 6). The increase in yield was due to vigorous vegetative growth, improved flowering, greater fruit set and larger fruit size under plastic mulch (Kasirajan *et al.*, 2012) [14]. These findings are in accordance with the results reported by (Agrawal *et al.*, 2010) [10] and (Nikolić *et al.*, 2012) [9].

3.2.5 Fruit yield per plot (kg)

The maximum fruit yield per plot was recorded under red plastic mulch (16.95 kg), statistically at par with black plastic mulch (16.10 kg), while the lowest value (9.30 kg) was recorded under the control (Table 2 and Graph 7). The increased yield was associated with improved water-use efficiency, nutrient uptake and reduced weed competition under plastic mulch. Similar findings were reported by (Agrawal *et al.*, 2024) [8].

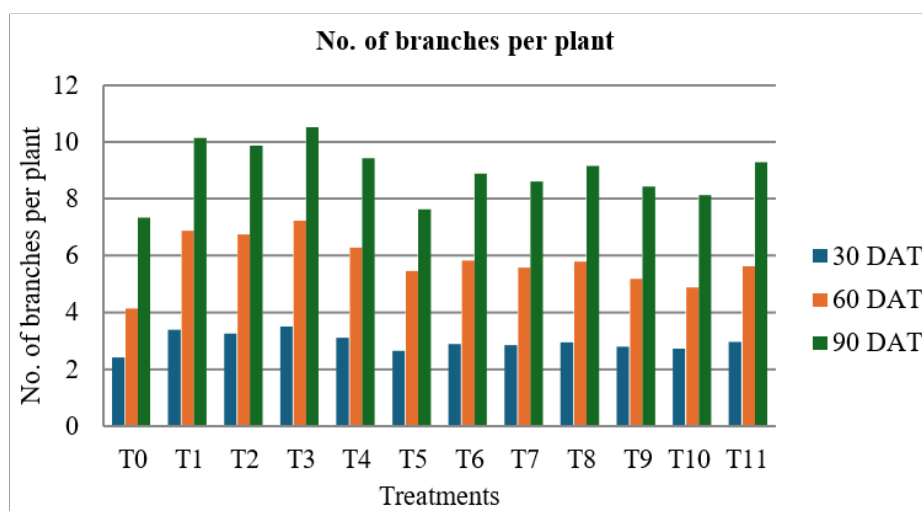


Graph 1. Graphical representation on plant height (cm) at 30, 60 and 90 DAT

3.2.6 Fruit yield (q/ha)

The highest fruit yield (423.75 q/ha) was recorded under red plastic mulch (T₃), statistically at par with black plastic mulch (402.50 q/ha), whereas the lowest fruit yield (232.50 q/ha) was obtained under the

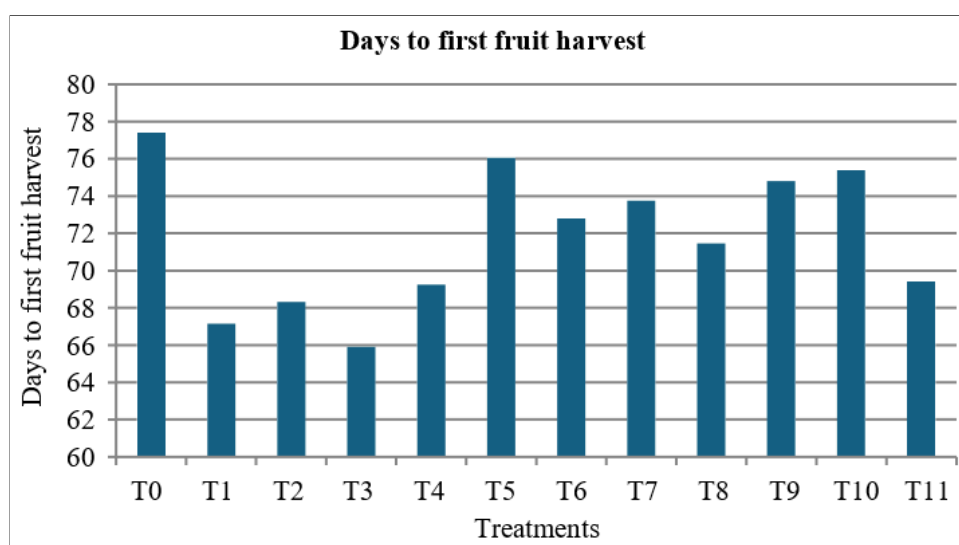
control (Table 2 and Graph 8). Higher yield under plastic mulch was due to improved plant growth, early flowering, greater fruit retention, enhanced fruit size and favourable soil hydrothermal conditions. These findings are in accordance with the results reported by (Agrawal *et al.*, 2010) [10].



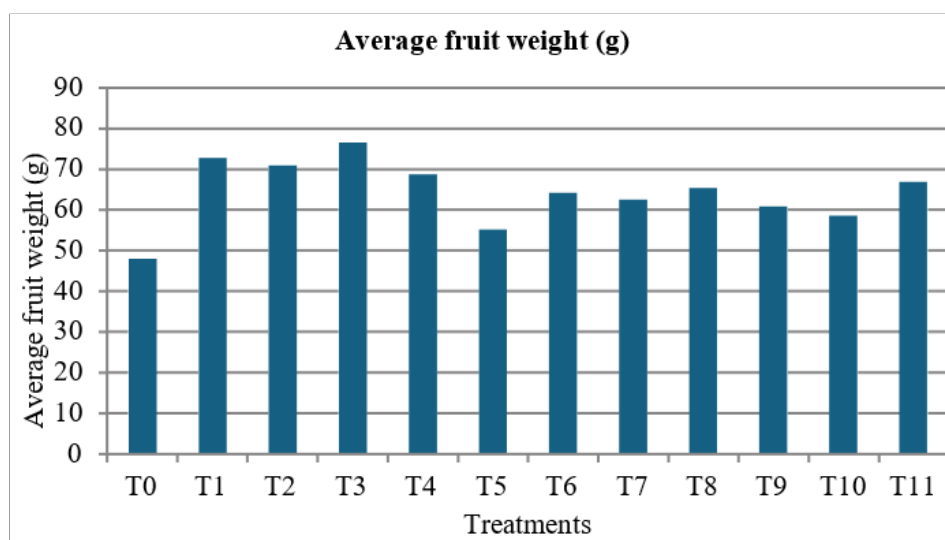
Graph 2. Graphical representation no. of branches per plant at 30, 60 and 90 DAT

Table 2. Effect of different mulching materials on yield parameters of tomato

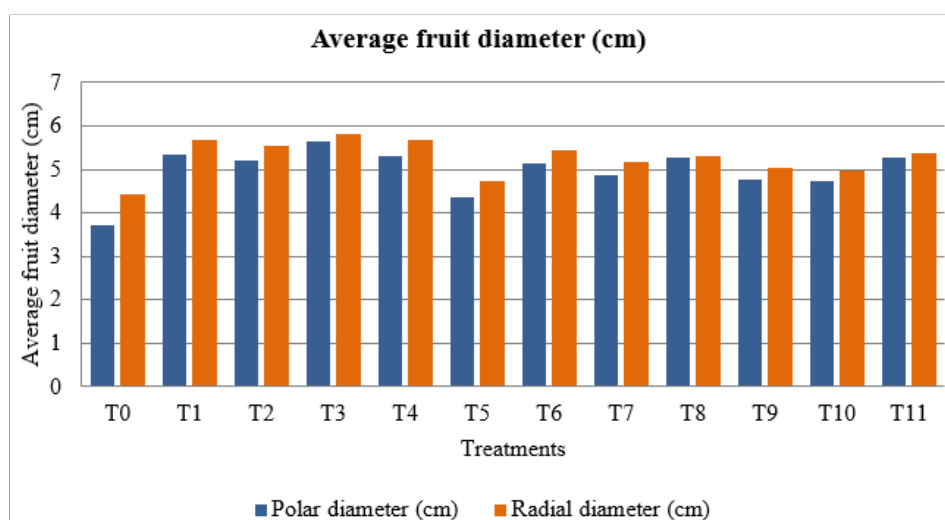
Tr. No.	Treatment details	Days to first fruit harvest	Average fruit weight (g)	Average fruit diameter (cm)		Fruit yield per plant (kg)	Fruit yield per plot (kg)	Fruit yield (q/ha)
				Polar	Radial			
T ₀	Control	77.44	47.92	3.73	4.43	0.62	9.30	232.50
T ₁	Black plastic mulch	67.17	72.65	5.33	5.69	1.07	16.10	402.50
T ₂	Transparent plastic mulch	68.33	70.80	5.21	5.56	1.01	15.20	380.00
T ₃	Red plastic mulch	65.92	76.40	5.63	5.81	1.13	16.95	423.75
T ₄	Paddy straw	69.26	68.65	5.31	5.68	0.97	14.60	365.00
T ₅	Sawdust	76.09	55.03	4.35	4.72	0.71	10.60	265.00
T ₆	Dry leaves	72.82	64.06	5.14	5.43	0.88	13.25	331.25
T ₇	Newspaper	73.78	62.41	4.88	5.16	0.83	12.50	312.50
T ₈	Dry grass	71.48	65.31	5.26	5.31	0.91	13.65	341.25
T ₉	Cardboard	74.83	60.73	4.75	5.04	0.79	11.80	295.00
T ₁₀	Woodchips	75.41	58.46	4.74	4.96	0.75	11.30	282.50
T ₁₁	Rice husk	69.45	66.72	5.28	5.38	0.94	14.05	351.25
	SE(m)±	2.20	2.01	0.16	0.17	0.04	0.43	13.70
	CD at 5%	6.46	5.90	0.46	0.50	0.11	1.27	40.19



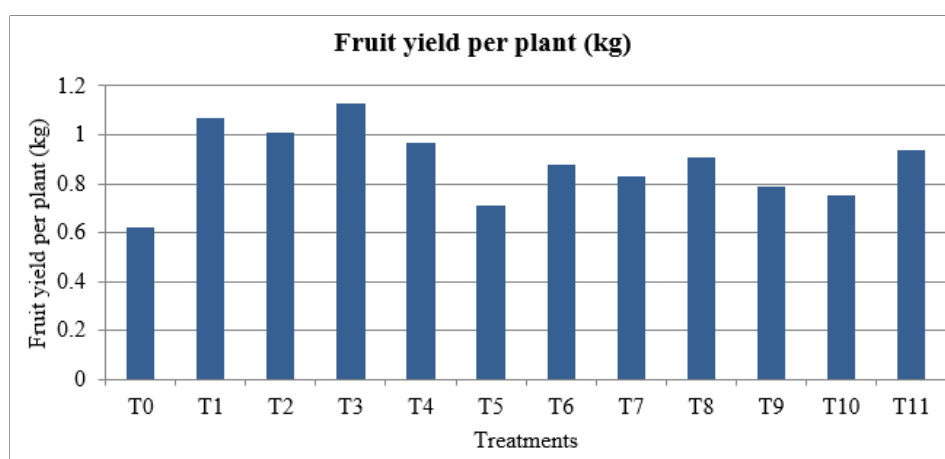
Graph 3. Graphical representation on days to first fruit harvest



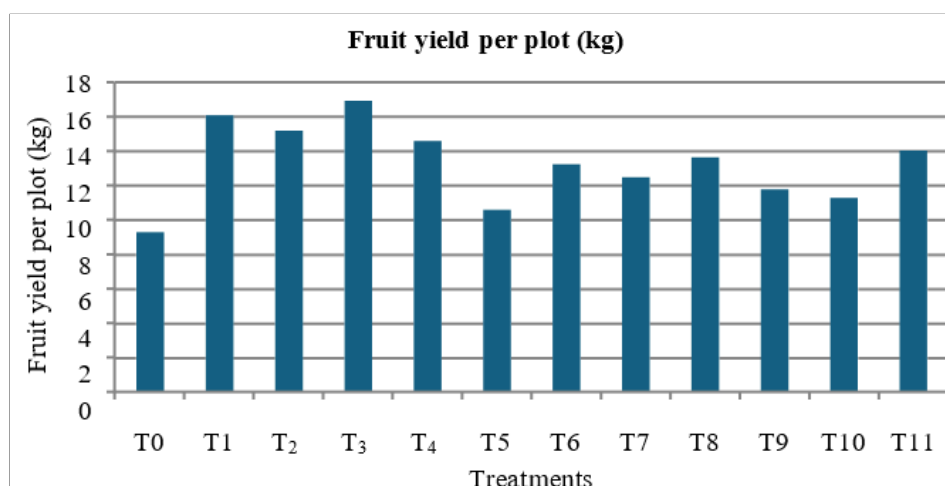
Graph 4. Graphical representation on average fruit weight (g)



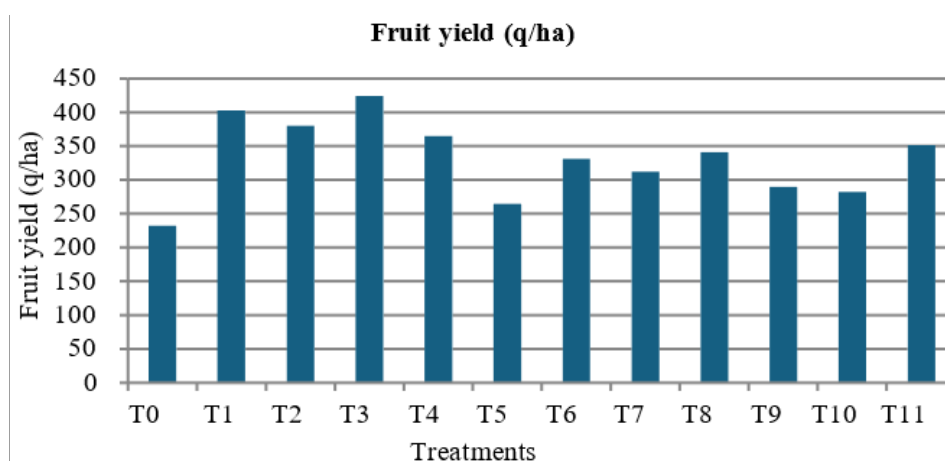
Graph 5. Graphical representation on average fruit diameter (cm)



Graph 6. Graphical representation on fruit yield per plant (kg)



Graph 7. Graphical representation on fruit yield per plot (kg)



Graph 8. Graphical representation on fruit yield (q/ha)

4. Conclusion

The present study concludes that organic and synthetic mulching materials had a significant comparative effect on growth, yield and productivity of tomato (*Solanum lycopersicum* L.) cv. Kashi Aman. Among all the treatments, red plastic mulch (T₃) proved to be the most effective, recording the tallest plant height and the maximum number of branches per plant at 30, 60 and 90 DAT, the earliest fruit harvest, the highest average fruit weight, fruit diameter and fruit yield (per plant, per plot and per hectare). Black plastic mulch (T₁) and transparent plastic mulch (T₂) were statistically comparable to red plastic mulch (T₃) for most of the traits studied, while organic mulches, particularly paddy straw (T₄), performed moderately better than the unmulched control. The unmulched control consistently recorded the poorest growth and yield performance. Therefore, red plastic mulch can be recommended as a highly effective mulching material for enhancing vegetative growth and improving yield attributes of tomato under similar agro-climatic conditions.

References

- Thapa B, Srivastava K, Bhandari H. Assessment studies on genetic variability traits in different lines of tomato (*Solanum lycopersicum* L.). International Journal of Current Microbiology and Applied Sciences. 2018;7(9):824-829.
- Anonymous. FAOSTAT statistical database. Food and Agriculture Organization; Area and production of horticultural crops in Chhattisgarh 2023-24, Government of Chhattisgarh. 2024.
- Kader MA, Senge M, Mojid MA, Ito K. Recent advances in mulching materials and methods for modifying soil environment. Soil & Tillage Research. 2017;168:155-166.
- Shreerama T, Trivedi J, Sharma D, Nair SK, Ramole S. Effect of mulching and training systems on growth parameters of tomato. International Journal of Research in Agronomy. 2025;8(4):670-675.
- Bahadur A, Singh AK, Singh KP. Effect of planting systems and mulching on soil hydrothermal regime, plant physiology, yield and water use efficiency in tomato. Indian Journal of Horticulture. 2013;70(1):48-53.
- Mendonça SR, Ávila MCR, Vital RG, Evangelista ZR, Pontes NC, Nascimento AR. The effect of different mulching on tomato development and yield. Scientia Horticulturae. 2021;275:109657.
- Lamont WJ. Plastics: Modifying the microclimate for the production of vegetable crops. HortTechnology. 2005;15(3):477-481.
- Agarwal A, Sharma P, Singh R, Kumar V. Influence of coloured plastic mulches on growth, yield and quality of tomato (*Solanum lycopersicum* L.). Journal of Experimental Agriculture International. 2024;46(3):45-56.
- Nikolić B, Radulović M, Spalević V, Nenezić E. Mulching methods and their effects on the yield of tomato (*Lycopersicon esculentum* Mill.) in the Zeta Plain. Agriculture & Forestry. 2012;58(1):17-33.
- Agrawal N, Panigrahi H, Sharma D, Agrawal R. Effect of different colour mulches on the growth and yield of tomato under Chhattisgarh region. Indian Journal of Horticulture. 2010;67(Special Issue):295-300.
- Pinder R, Rana R, Maan D, Kumar K. Impact of different mulching materials on the growth and yield of tomato (*Solanum lycopersicum*) in Dehradun region of Uttarakhand. International Journal of Environment, Agriculture and Biotechnology. 2016;1(4):631-636.

12. Singh H, Sharma P, Kumar P, Dhillon NS, Sekhon BS. Influence of mulching on growth and yield of tomato (*Solanum lycopersicum* L.) under protected environment. *Biotechnology Journal International*. 2017;19(2):1-6.
13. Rao KVR, Gangwar S, Bajpai A, Chourasia L, Soni K. Effect of different mulches on the growth, yield and economics of tomato (*Lycopersicon esculentum*). *International Journal of Agriculture Sciences*. 2016;8(44):1886-1887.
14. Kasirajan S, Ngouajio M. Polyethylene and biodegradable mulches for agricultural applications: A review. *Agronomy for Sustainable Development*. 2012;32(2):501-529.

How to cite this article: Toppo P, Sao B, Kerketta A, Dhruw SS, Sao R, Sinha T, et al. Comparative effect of organic and synthetic mulches on growth, yield and productivity of tomato (*Solanum lycopersicum* L.) cv. Kashi Aman. *International Journal of Research in Agronomy*. 2026;9(9):1112-1118. doi: <https://www.doi.org/10.33545/2618060X.2026.v9.i9o.6656>

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