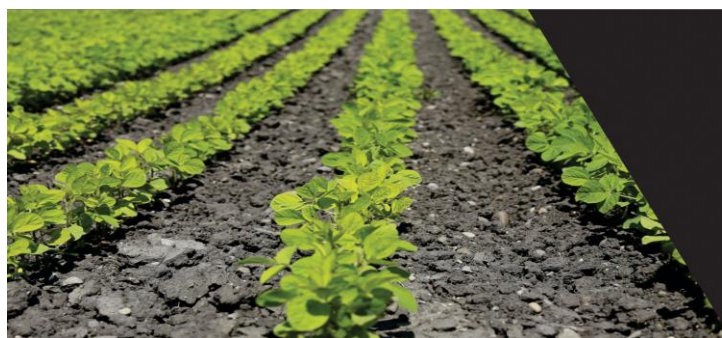




International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
© Agronomy
NAAS Rating (2026): 5.20
www.agronomyjournals.com
2026; 9(7): 328-334
Received: 27-04-2026
Accepted: 30-05-2026

Hiral Chaudhary
College of Horticulture, Junagadh
Agricultural University, Junagadh,
Gujarat, India

Dr. DR Kanzaria
Associate Professor, College of
Horticulture, Junagadh
Agricultural University, Junagadh,
Gujarat, India

Khushboo Vank
College of Horticulture, Junagadh
Agricultural University, Junagadh,
Gujarat, India

Mukesh N Patel
College of Horticulture, Junagadh
Agricultural University, Junagadh,
Gujarat, India

Corresponding Author:
Hiral Chaudhary
College of Horticulture, Junagadh
Agricultural University, Junagadh,
Gujarat, India

Effect of different type of mulches on growth, yield and economics of okra (*Abelmoschus esculentus* (L.) moench.) CV. GO 6

Hiral Chaudhary, DR Kanzaria, Khushboo Vank and Mukesh N Patel

DOI: <https://www.doi.org/10.33545/2618060X.2026.v9.i7e.5947>

Abstract

A field experiment was conducted during Summer-2024 at the Instructional Farm, Jambuvadi, College of Horticulture, Junagadh Agricultural University, Junagadh, Gujarat, India, to evaluate the “Effect of different type of mulch treatments on the growth and yield of okra (*Abelmoschus esculentus* (L.) Moench)”. The experiment was laid out in a Randomized Block Design with three replications and seven treatments. The treatments consisted of: T₁ – black polythene mulch, T₂ – silver polythene mulch, T₃ – white polythene mulch, T₄ – red polythene mulch, T₅ – green polythene mulch, T₆ – organic mulch (agricultural waste), and T₇ – control (no mulch). The results revealed that silver polythene mulch (T₂) significantly improved the growth and yield of okra. The minimum days to germination (5.57 days), maximum number of branches per plant (3.19), highest plant height at final picking (113.57 cm) and Total dry biomass was also highest under silver polythene mulch (T₂), whereas the lowest biomass was observed in the control (T₇). Earliness was significantly influenced by mulching, with minimum days to 50% flowering (32.22 days) and earliest first picking (45.41 days) recorded under T₂. Yield attributes such as number of pods per plant (15.35), pod diameter (1.54 cm), pod length (11.06 cm), and pod weight (12.83 g) were also highest under T₂. Consequently, pod yield per plant (0.19 kg) and pod yield per hectare (13.88 t ha⁻¹) were maximum under T₂, while the lowest yield was recorded in the control. Thus, mulching with silver polythene mulch increased the growth and yield of okra and resulted in maximum net returns and benefit–cost ratio.

Keywords: Mulch, okra, growth, germination, yield

Introduction

India ranks as the second-largest producer of vegetables globally after China, contributing approximately 14% of total global vegetable production. The country’s vast agro-climatic diversity, encompassing tropical, subtropical, temperate, and arid regions, facilitates year-round cultivation and ensures the availability of a wide range of vegetable crops. Vegetables occupy a prominent place in the traditional Indian diet and have long been integral to nutritional security. From a nutritional standpoint, vegetables are rich sources of essential macronutrients and micronutrients, including carbohydrates, proteins, vitamins (such as A, C, and folates), minerals (such as calcium, potassium, and iron), dietary fiber, and phytochemicals such as glucosinolates and antioxidants. These constituents play a vital role in supporting metabolic functions, enhancing immune response, and reducing the risk of non-communicable diseases. Therefore, vegetables constitute a critical component of sustainable agricultural systems and public health frameworks in India, contributing to dietary diversity and helping to combat malnutrition in both rural and urban populations.

Abelmoschus esculentus (L.) Moench, commonly known as okra or bhindi, is one of the most important tropical vegetable crops in India. It belongs to the family Malvaceae and is native to Africa and Asia. The crop is widely valued for its tender pods, nutritional quality, and adaptability to warm climatic conditions. Although primarily a rainfed crop, okra performs well under irrigated conditions during both kharif and summer seasons. It is sensitive to frost and low temperatures. An optimum temperature range of 24–28°C is required for normal growth and development, while

a temperature of 25–35°C with adequate soil moisture is essential for seed germination. Okra can be cultivated in a variety of soils, ranging from sandy loam to medium clay soils, provided they are well-drained and rich in organic matter. The crop is mainly grown for its tender fruits, which are widely used as a vegetable. These fruits can also be dehydrated and marketed. Additionally, different parts of the okra plant have industrial uses; for instance, roots and stems are used in clarifying sugarcane juice during jaggery and sugar production (Chauhan, 1972) [5]. Mature seeds can be roasted, ground, and used as a coffee substitute, while mature fruits and stems contain crude fiber suitable for paper production. Okra fruits are nutritionally rich, containing approximately 6.4 g carbohydrates, 2.2 g protein, 0.2 g fat, 66 mg calcium, 500 mg phosphorus, 1.5 mg iron, and 13 mg vitamin C per 100 g of edible portion. Furthermore, okra is considered a good source of iodine and is beneficial in preventing goiter. It is also reported to be beneficial for individuals with cardiac weakness (Yawalkar, 1969) [18].

In India, major okra-growing states include West Bengal, Gujarat, Bihar, Odisha, Jharkhand, Uttar Pradesh, Chhattisgarh, Madhya Pradesh, and Andhra Pradesh. The crop is cultivated over an area of about 5.57 lakh hectares, with a production of 73.05 lakh tonnes and a productivity of 13.12 t ha⁻¹ (Anon., 2026). Gujarat ranks first in okra production in India. Within the state, major producing districts include Surat, Tapi, Navsari, Vadodara, Bharuch, Ahmedabad, Mehsana, and Gandhinagar. Gujarat occupies an area of approximately 0.99 lakh hectares, with a production of 11.33 lakh tonnes and a productivity of 12.14 t ha⁻¹ (Anon., 2026).

Mulching is an important agronomic practice that involves covering the soil surface with organic or inorganic materials to modify the soil microclimate, conserve moisture, and suppress weed growth. Typically, mulch is applied in layers of ≥5 cm thickness. The use of polyethylene film as mulch began in the mid-1950s, and Emery M. Emmert was among the first to recognize its potential benefits. Mulching influences soil moisture, temperature, erosion, and biological activity in the seedbed zone, thereby promoting early crop growth and higher yields (Thakur *et al.*, 2020) [16]. Mulches can be broadly classified into three types: (i) organic mulches, such as straw, sawdust, husk, leaves, and compost, commonly used in traditional and small-scale farming; (ii) inorganic mulches, including plastic films such as black, silver-black, and white polyethylene, widely adopted in commercial horticulture since the 1960s; and (iii) living mulches, which involve the use of cover crops (e.g., legumes) to suppress weeds and enhance soil fertility. The use of plastic mulch in protected cultivation systems (such as net houses and polyhouses) has been reported to increase yield up to 19.8 t ha⁻¹ compared to non-mulched open-field conditions and improve water use efficiency by 13–28% (Thakur *et al.*, 2020) [16].

Thus, the use of mulching in okra cultivation may promote early flowering, fruit set, and maturity, resulting in higher market prices. Additionally, water scarcity is a major constraint in agriculture; therefore, mulching can be an effective technique for conserving soil moisture and improving water use efficiency, ultimately enhancing crop productivity.

Materials and Methods

A field experiment was conducted during Summer 2024 at the Instructional Farm, Jambuvadi, College of Horticulture, Junagadh Agricultural University, Junagadh, Gujarat, India, to evaluate the effect of different mulch treatments. The experimental soil was neutral in pH and electrical conductivity, low in organic carbon and available nitrogen, and medium in available phosphorus and

potassium. The experiment was laid out in a Randomized Block Design (RBD) with three replications and seven treatments. The treatments consisted of: T₁ – black polythene mulch, T₂ – silver polythene mulch, T₃ – white polythene mulch, T₄ – red polythene mulch, T₅ – green polythene mulch, T₆ – organic mulch (agricultural waste), and T₇ – control (no mulch).

Before the commencement of the experiment, the field was thoroughly ploughed and prepared to obtain a fine tilth. Harrowing and planking were carried out prior to layout of the experimental plots. A total of 21 plots were laid out as per the experimental design. Mulch materials were applied to the respective plots prior to sowing. Plastic mulch sheets (black, silver, white, red, and green) were cut into pieces of 3 m × 3 m and used to cover the entire plot area. Holes were made in the plastic sheets at the recommended spacing to facilitate seed sowing. In the organic mulch treatment (T₆), agricultural waste in the form of wheat straw was uniformly spread over the plot to a thickness of approximately 10 cm. Seeds were sown at a spacing of 45 cm between rows and 30 cm between plants, with two seeds per hill. Well-decomposed farmyard manure (FYM) was applied uniformly at the rate of 12 t ha⁻¹ and incorporated into the soil during land preparation. Fertilizers were applied at the rate of 150 kg N ha⁻¹ and 50 kg P₂O₅ ha⁻¹. Irrigation was provided at 4-to-5-day intervals through a drip irrigation system to ensure optimal plant growth.

Observations recorded

For recording different field observations, five plants of okra from each net plot area were selected randomly in the beginning and tagged using labels. Observations were recorded as per characters.

Growth parameters

Germination (%)

The germinated seeds were counted per plot from each treatment. Calculate the germination (%) with the help of formula.

$$\text{Germination (\%)} = \left(\frac{\text{Seeds germinated}}{\text{Total seeds sown}} \right) \times 100$$

Number of branches per plant, Plant height at final picking (cm) and Total dry biomass (g):

The number of branches per plant and height of okra plant was counted and measured from five tagged plants and their mean was recorded. For total dry weight selected five plants were uprooted and dry in sun or oven to a constant weight.

Leaf Area Index

Leaf area index was estimated by taking five randomly selected tagged plants in every treatment. The leaf area index was calculated by dividing the total leaf area with the corresponding ground area as suggested by Watson (1952). Leaf area index was calculated by using the following formula.

$$\text{LAI} = \left(\frac{\text{Total leaf area (cm}^2\text{)}}{\text{Total seed sown area (cm}^2\text{)}} \right) \times 100$$

Yield parameters

Days to 50% flowering and Days to first picking: The number of days from the date of sowing to the day on which 50% of the plant population showed flowering was counted and number of days was counted from the date of sowing to date of first picking appeared in each treatment.

Number of pods per plant, Marketable pod diameter (cm), Marketable pod length (cm), Pod weight (g), Pod yield per plant (kg) and Pod yield (t/ha): The earlier randomly selected five plants were used for the observation. The number of pods produced by each observed plant was counted and the mean worked out to the pods produced per plant. The pod diameter was measured at the top, middle and bottom of the pod was recorded with the help of vernier calipers and its average was worked out in centimeter. Length of green pod was recorded from five randomly selected pods for marketable pod length.

Result and discussion: Tables No. 1, 2 and 3 present the Effect of different type of mulches on growth, yield and economics of okra. These tables provide detailed information and results regarding the performance of the different treatment in the experiment.

Growth parameter: The analysis of data revealed that mulch application significantly influenced various growth parameters of okra, including days to germination, number of primary branches per plant, days to 50% flowering, plant height at final picking, and total dry biomass. Among the treatments, application of silver polythene mulch (T₂) exhibited the most pronounced effect, recording minimum days to germination (5.57 days), maximum number of branches per plant (3.19), highest plant height at final picking (113.57 cm), and maximum total dry biomass (3273.00 g plot⁻¹). Earlier germination observed under plastic mulch can be attributed to increased soil moisture content and elevated soil temperature, which together improved the microclimate around the seed. These favorable conditions likely enhanced metabolic activities, leading to faster germination. Plastic mulch also maintained adequate soil moisture in the root zone, promoting active cell division and elongation, which ultimately resulted in increased plant height. Furthermore, the higher number of branches observed in mulched plants may be due to the consistent availability of moisture and optimal soil temperature conditions, which are essential for vegetative growth. Among the different mulch treatments, silver plastic mulch recorded the highest dry matter production. This could be due to the maintenance of optimum moisture levels throughout the root zone, which enhanced physiological processes such as photosynthesis and nutrient uptake. Improved physiological efficiency likely contributed to greater dry matter accumulation, ultimately leading to higher yield.

These findings are in agreement with the results reported by Abu-Bakr and Mustafa (2003)^[1] and Mahadeen (2014). Similar results were also observed by Ashrafuzzaman *et al.* (2011)^[3] in chilli, More *et al.* (2014)^[12], Nagalakshmi *et al.* (2002)^[13] in chilli, and Pinder *et al.* (2016)^[14] in tomato. In summary, silver polythene mulch (25-micron thickness) was found to be beneficial in promoting early germination, increasing the number of branches per plant, enhancing plant height at final picking, and improving total dry biomass.

Yield Parameter

The experimental data clearly indicated that mulch treatments had a significant influence on various yield parameters of okra,

including days to 50% flowering, days to first picking, pod length, pod diameter, number of pods per plant, and pod yield per plant and per hectare. Among the treatments, application of silver polythene mulch (T₂) recorded the minimum days to 50% flowering (39.22 days) and earliest first picking (45.41 days). It also produced the highest number of pods per plant (15.35), maximum pod diameter (1.54 cm), maximum pod length (11.06 cm), highest pod yield per plant (0.19 kg), and maximum pod yield per hectare (13.88 t ha⁻¹).

Plastic mulching significantly improved crop growth, flowering, and yield attributes by modifying the soil microclimate. Increased soil moisture retention and moderated soil temperature under mulch created favorable conditions for early growth and development, resulting in advanced flowering. Reflective mulches, particularly silver polythene, helped regulate excessive soil heating by reflecting solar radiation, thereby maintaining an optimum root-zone environment during high-temperature conditions. Improved hydrothermal conditions enhanced nutrient uptake efficiency, photosynthate accumulation, and cell expansion, which contributed to increased pod diameter, pod weight, and overall fruit development. The higher number of fruits per plant in mulched plots can be attributed to better moisture conservation, improved above- and below-ground microclimate, and reduced weed competition. Additionally, prolonged soil moisture availability under mulch facilitated greater nutrient absorption, leading to enhanced plant growth and biomass accumulation compared to non-mulched control. Overall, the use of plastic mulch, especially reflective types, proved effective in improving plant physiological performance and increasing yield.

These findings are in close agreement with the results reported by Abu-Bakr and Mustafa (2003)^[1] in okra, Iqbal *et al.* (2009)^[8] and Hudu *et al.* (2002)^[7] in chilli. Rajbir Singh (2005)^[15], and Aruna *et al.* (2007)^[2] in tomato. Similar observations were also reported by Awasthi *et al.* (2005)^[4], Ekinci and Dursun (2009)^[6], Wahome *et al.* (2009)^[17] in cabbage, Thakur *et al.* (2020)^[16] in capsicum, Meena *et al.* (2024)^[11] in okra, and Kere *et al.* (2003)^[9] in tomato. In summary, silver polythene mulch (25 micron thickness) was found to be beneficial in promoting early flowering and first picking, and in improving pod length, pod diameter, number of pods per plant, and overall pod yield (kg plant⁻¹ and t ha⁻¹).

Economics

The major consideration with the vegetable growers for the adoption of research-based production technology is economics. The economics in terms of gross and net returns for various mulch treatment were worked out and presented in Table 2.0. The different type of treatments were registered more or less a good value of benefit-cost ratio. This indicated that the sowing of okra with proper type of mulching is economical. The conjoint application of silver polythene mulch (T₂) achieved the more pod yield of 13.88 t/ha and recorded the higher benefit-cost ratio of 3.08 which was closely followed by the treatment T₁.

Table 1: Effect of different type of mulches on growth parameter of okra

Treatment	Days to germination	No of branches/plant	Plant height at final picking (cm)	Total dry mass (g/plot)
T ₁ : Black polythene mulch	6.43	2.94	103.78	3062.67
T ₂ : Silver polythene mulch	5.57	3.19	113.57	3273.00
T ₃ : White polythene mulch	6.57	2.63	93.02	2838.67
T ₄ : Red polythene mulch	7.10	2.08	87.32	2778.00
T ₅ : Green polythene mulch	7.20	1.89	80.24	2649.67

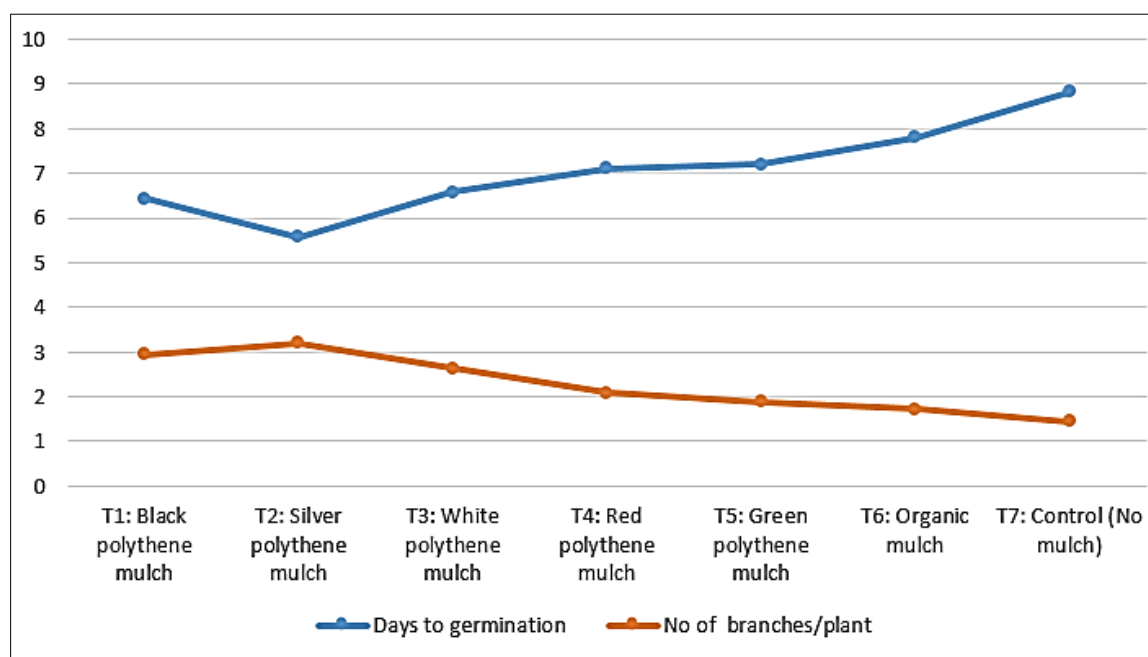
T ₆ : Organic mulch	7.80	1.71	73.06	2536.00
T ₇ : Control (No mulch)	8.83	1.44	71.18	1916.67
S.Em. $\pm$	0.172	0.090	4.636	128.709
C.D. at 5%	0.53	0.28	14.29	396.59
C.V.%	4.20	6.85	9.03	8.19

Table 2: Effect of different type of mulches on economics of okra

Treatment	Gross return (₹/ha)	Net returns (₹/ha)	Benefit cost ratio
T ₁ : Black polythene mulch	383700	250479	2.88
T ₂ : Silver polythene mulch	416400	281239	3.08
T ₃ : White polythene mulch	372900	237779	2.76
T ₄ : Red polythene mulch	365700	233129	2.76
T ₅ : Green polythene mulch	353100	219329	2.64
T ₆ : Organic mulch	338400	210979	2.66
T ₇ : Control (No mulch)	287700	173269	2.51

Table 3: Effect of different type of mulches on Yield parameter of okra

Treatments	Days to 50% flowering	Days to first picking	No. of pods per plant	Pod diameter (cm)	Pod length (cm)	Pod weight (g)	Pod yield /plant (kg)	Pod yield/ha (t)
T ₁ : Black polythene mulch	42.68	49.63	14.68	1.39	10.92	12.18	0.170	12.79
T ₂ : Silver polythene mulch	39.22	45.41	15.35	1.54	11.06	12.83	0.190	13.88
T ₃ : White polythene mulch	42.97	49.88	13.96	1.37	9.62	11.79	0.162	12.43
T ₄ : Red polythene mulch	43.50	50.75	13.55	1.29	9.02	11.62	0.155	12.19
T ₅ : Green polythene mulch	41.19	48.88	13.87	1.26	8.76	11.49	0.157	11.77
T ₆ : Organic mulch	44.97	51.94	13.40	1.32	8.14	11.41	0.151	11.28
T ₇ : Control (No mulch)	49.45	56.13	12.55	1.24	7.89	10.28	0.127	9.59
S.Em. $\pm$	1.770	0.345	0.446	0.059	0.364	0.351	0.005	0.358
C.D. at 5%	5.45	1.06	1.37	0.18	1.12	1.08	0.014	1.10
C.V.%	7.06	1.19	5.55	7.56	6.74	5.21	5.07	5.17

**Fig 1:** Effect of different type of mulches on Days to germination and No. of branches/plant of okra

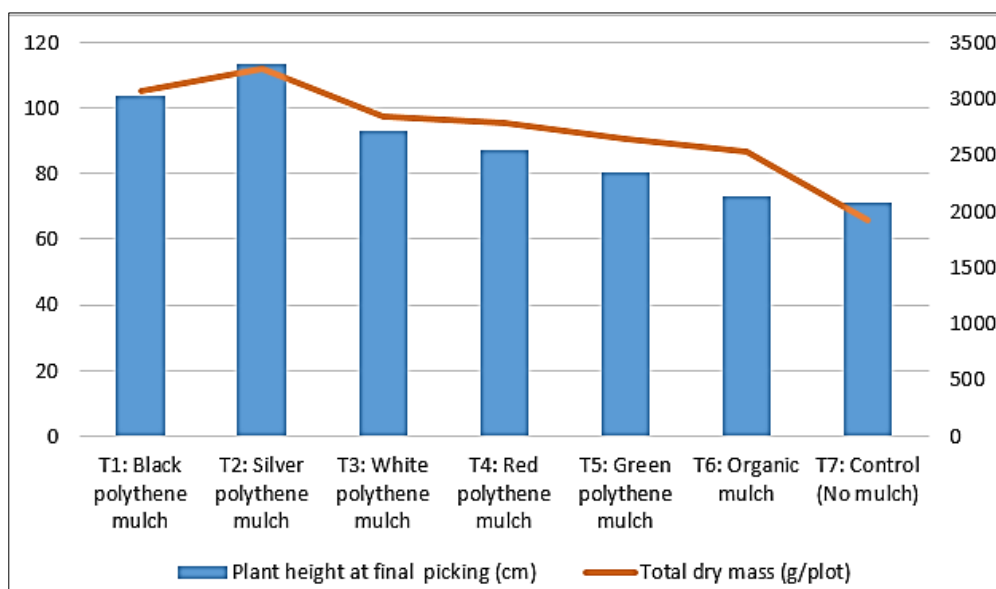


Fig 2: Effect of different type of mulches on Plant height at final picking and Total dry mass of okra

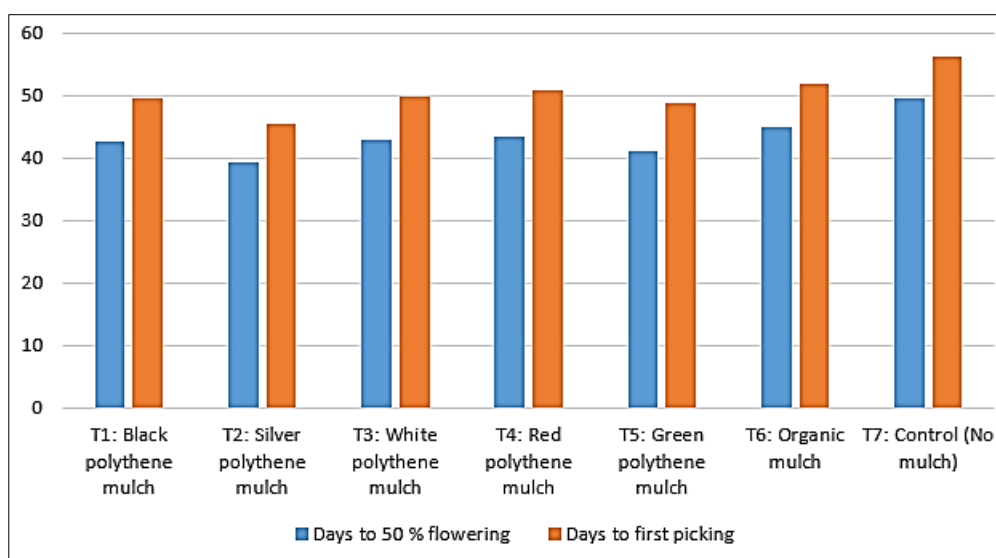


Fig 3: Effect of different type of mulches on Days to 50% flowering and Days to first picking of okra

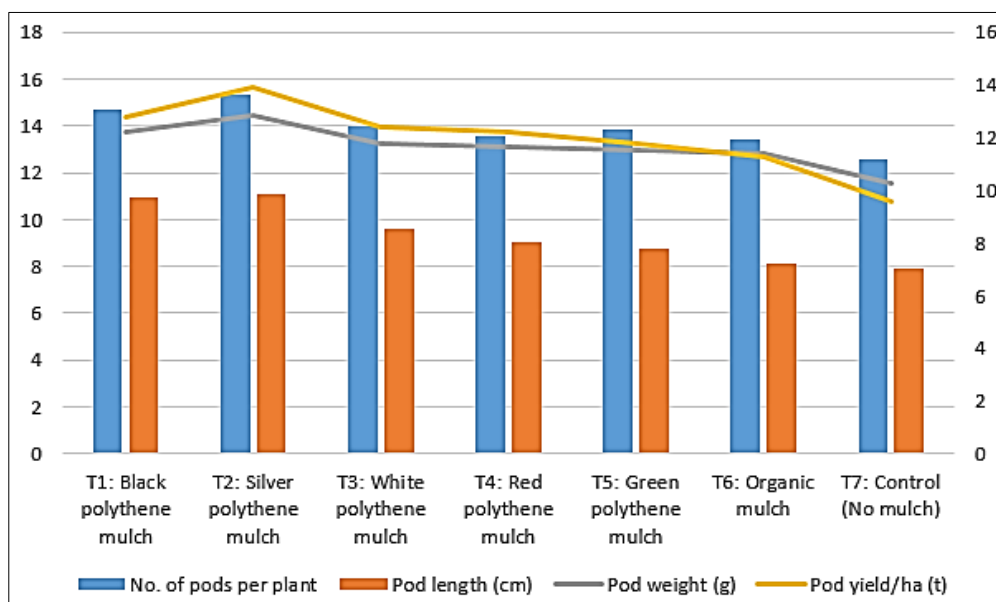


Fig 4: Effect of different type of mulches on No. of pods per plant, Pod length, Pod weight and Pod yield of okra

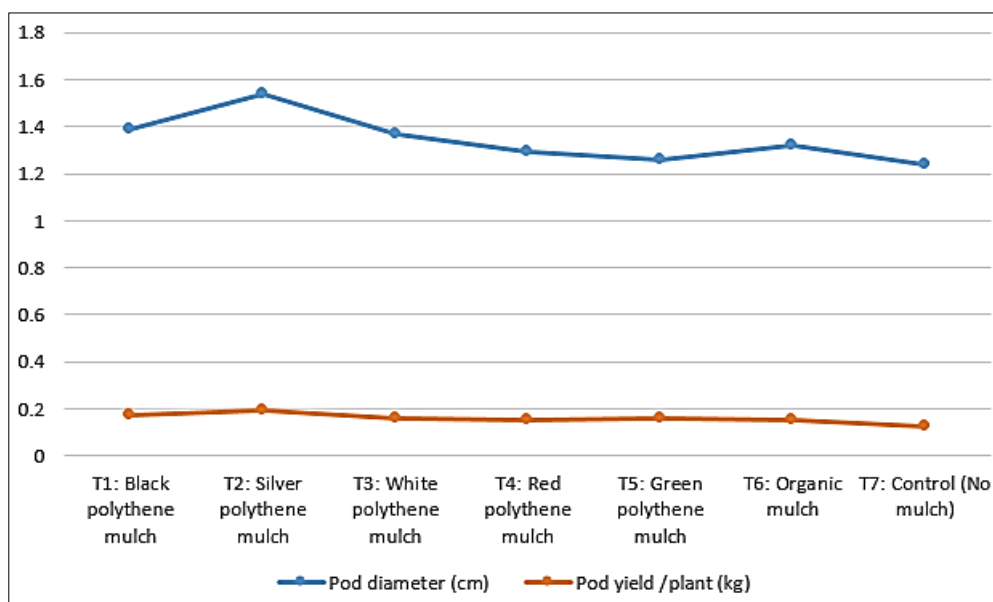


Fig 5: Effect of different type of mulches on Pod diameter and Pod yield/plant of okra

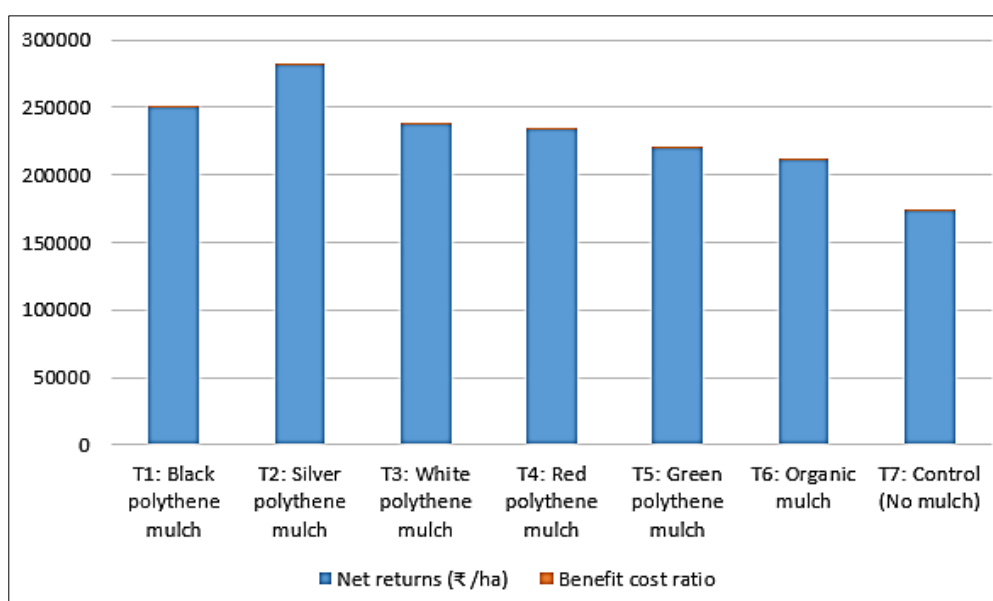


Fig 6: Effect of different type of mulches on net return and benefit cost ratio of okra

References

1. Abu-Bakr AA, Mustafa MAE. Use of plastic mulch for better performance and yield of okra during winter in Sudan. U.K. Journal of Agricultural Sciences. 2003;11(2).
2. Aruna P, Sudagar IP, Manivannan MI, Rajangam J, Natarajan S. Effect of fertigation and mulching for yield and quality in tomato cv. PKM-1. Asian Journal of Horticulture. 2007;2(2):50-54.
3. Ashrafuzzaman M, Halim MA, Ismail MR, Shahidullah SM, Hossain MA. Effect of plastic mulch on growth and yield of chilli. Brazilian Archives of Biology and Technology. 2011;54(2):321-330.
4. Awasthi OP, Singh IS, Sharma BD. Effect of mulch material on soil-hydrothermal regimes, growth and fruit yield of brinjal (*Solanum melongena*) under arid conditions. Vegetable Science. 2005;32(1):98-99.
5. Chauhan DVS. Vegetable production in India. 3rd ed. Agra: Ram Prasad and Sons; 1972.
6. Ekinci M, Dursun A. Effects of different mulch materials on plant growth, some quality parameters and yield in melon (*Cucumis melo* L.). Pakistan Journal of Botany. 2009;41(4):1891-1901.
7. Hudu AI, Futuless KN, Gworgwor NA. Effects of mulching intensity on the growth and yield of irrigated tomato (*Lycopersicon esculentum* Mill.) and weed infestation in semi-arid zone of Nigeria. Journal of Sustainable Agriculture. 2002;21:37-45.
8. Iqbal Q, Amjad M, Asi MR, Ali MA, Ahmad R. Vegetative and reproductive evaluation of hot peppers under different plastic mulches in poly/plastic tunnel. Pakistan Journal of Agricultural Sciences. 2009;46(2):113-118.
9. Kere GM, Nyanjage MO, Liu G, Nyalala SPO. Influence of drip irrigation schedule and mulching material on yield and quality of greenhouse tomato (*Lycopersicon esculentum* L.). Asian Journal of Plant Sciences. 2003;2(14):1052-1058.
10. Mahdeen AY. Effect of polyethylene black plastic mulch on growth and yield of two summer vegetable crops under rain-fed conditions in semi-arid regions. American Journal of Agricultural and Biological Sciences. 2014;9(2):202-207.
11. Meena A, Narolia R, Kumar L. Influence of drip irrigation,

- crop geometry and mulching on morphological and nutritional traits of okra (*Abelmoschus esculentus* L.). Indian Journal of Agricultural Sciences. 2024;94(11):1207-1212.
12. More S, Gohil H, Bhandari DR, Patil, Tekale GS. Productivity and profitability of tomato (*Lycopersicon esculentum* Mill.) influenced by various transplanting dates and mulches. Trends in Biosciences. 2014;7(17):2376-2381.
 13. Nagalakshmi S, Palanisamy D, Eswaran S, Sreenarayanan VV. Influence of plastic mulching on chilli yield and economics. South Indian Horticulture. 2002;50:262-265.
 14. Pinder R, Kumar K. Impact of different mulching materials on the growth and yield of tomato (*Solanum lycopersicum*) in Dehradun region of Uttarakhand. International Journal of Agriculture Sciences. 2016.
 15. Singh R. Influence of mulching on growth and yield of tomato (*Solanum lycopersicum* L.) in North Indian plains. Vegetable Science. 2005;32(1):55-58.
 16. Thakur PS, Thakur A, Kanaujia SP. Reversal of water stress effects: mulching impact on the performance of Capsicum annum under water deficit. Indian Journal of Horticulture. 2000;57(3):250-254.
 17. Wahome PK, Shongwe V, Mbewe DN. Response of cabbage (*Brassica oleracea* var. capitata) to mulching and different irrigation regimes. American-Eurasian Journal of Agricultural and Environmental Sciences. 2009;6(6):662-669.
 18. Yawalkar KS. Vegetable crops of India. Nagpur: Agri-Horticultural Publishing House; 1969.