International Journal of Advanced Biochemistry Research

ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2025): 5.29
IJABR 2025; SP-9(9): 1532-1535
www.biochemjournal.com
Received: 25-06-2025
Accepted: 28-07-2025

Ch Mounika
M. Sc. (Hort.) Department of Vegetable Science, Dr. YSRHU, College of Horticulture, Anantharajupeta, Andhra Pradesh, India

P Syam Sundar Reddy
Principal Scientist (Horticulture), Citrus Research Station, Petlur, Andhra Pradesh, India

Y Deepthi Kiran
Assistant Professor (Agronomy), Dr. YSRHU-College of Horticulture, Anantharajupeta, Andhra Pradesh, India

Syed Sadarunnisa
Professor & Head (Vegetable Science), Dr. YSRHU-College of Horticulture, Anantharajupeta, Andhra Pradesh, India

B Hari Mallikarjuna Reddy
Assistant Professor (Statistics), Dr. YSRHU-College of Horticulture, Anantharajupeta, Andhra Pradesh, India

Corresponding Author:
Ch Mounika
M. Sc. (Hort.) Department of Vegetable Science, Dr. YSRHU, College of Horticulture, Anantharajupeta, Andhra Pradesh, India

Impact of organic and inorganic mulches on cauliflower growth, yield and economic viability

Ch Mounika, P Syam Sundar Reddy, Y Deepthi Kiran, Syed Sadarunnisa and B Hari Mallikarjuna Reddy

DOI: https://www.doi.org/10.33545/26174693.2025.v9.i9Ss.5722

Abstract
A field experiment was conducted during the late *Rabi* season of 2024 using a Randomised Block Design with eight treatments and three replications to assess the impact of mulching on growth and yield of cauliflower (*Brassica oleracea* var. *botrytis* L.). Among inorganic mulches, white polythene (T_3) recorded the highest plant height (52.9 cm), number of leaves (22.62), plant spread (44.02 cm), and leaf area (231.54 cm²) at all the stages of crop growth. It also produced the maximum curd length (14.83 cm), curd diameter (15.48 cm), curd weight (550.58 g), curd volume (494.34 cc) and curd yield (20,789 kg/ha). Among organic mulches, paddy straw (T_4) performed best, being statistically comparable to white polythene for maximum parameters. Silver (T_2), black (T_1), and sawdust (T_5) mulches showed moderate improvements, while the un weeded control (T_8) recorded the lowest values. Gross, net returns and B:C ratio were also recorded higher under white polythene mulch. The study concludes that among these, white polythene mulch is best not only for its agronomic benefits but also for its economic viability. Although paddy straw mulch contributes organic matter to the soil and supports microbial activity, it requires more labour for application and decomposes quickly, limiting its reuse.

Keywords: Cauliflower, mulching, growth, yield, economics

Introduction
Cauliflower (*Brassica oleracea* var. *botrytis L.*), a cool-season cole crop of the family Cruciferaceae, was introduced to India in 1822 and is now extensively cultivated. Globally, China (36.8%) and India (34.6%) dominate production, together contributing over 70% of the total yield, with West Bengal leading cultivation within India. Cauliflower curds are highly nutritious, containing about 90.8% moisture, 2.6% protein, 1.2% fibre, 4.0% carbohydrates, and 30 kcal per 100 g edible portion, along with essential minerals (Ca, P, Fe) and vitamins (carotene, thiamine, riboflavin, niacin, vitamin C).

Andhra Pradesh's diverse climate and soils (red and alluvial) make it ideal for cauliflower, which thrives in mild temperatures. With high market demand, profitability and government support through subsidies and schemes, cauliflower is a promising crop for farmers. Mulching is recognised as an effective cultural practice for the favourable modification of the microclimate (Kasirajan and Ngouajio, 2012) [6].

Mulching materials are categorised into two primary types - organic or biodegradable mulches, derived from plant and animal-based materials such as sawdust, straw, compost, and manure and inorganic mulches, predominantly composed of plastic-based materials (Kader *et al*., 2017) [5]. The selection of an appropriate mulching material is influenced by several factors, including the type and characteristics of the material, ecological conditions, colour, thickness, perforation design, availability, cost effectiveness and suitability for the specific crop being cultivated (Wang *et al*., 2015) [19]. Among these, plastic mulches are widely adopted in modern agriculture for their versatility and efficiency. Different coloured mulches such as black, white, red, yellow, silver, green, brown and blue regulate light absorption and influence crop physiology to optimize growth. Mulching regulates soil temperature, conserves moisture, reduces evaporation and suppresses weed growth. It also protects plant roots from heat stress and improves overall agricultural productivity.

Material and Methods

The study entitled "Effect of organic and inorganic mulches on growth and yield of cauliflower (*Brassica oleracea* var. *botrytis* L.)," was carried out during the late *Rabi* season of 2024 at Dr. YSRHU College of Horticulture, Anantharajupeta, located in Annamayya district, Andhra Pradesh, which is situated in the Southern Agro-climatic zone of Andhra Pradesh, resting at an altitude of 162 meters above mean sea level. Positioned at 13.98° North latitude and 79.40° East longitude, it falls under the tropical belt and generally receives 966.1mm of rainfall annually. The field experiment was laid out using a Randomised Block Design (RBD), consisting of 8 treatments with three replications. Treatment details were as follows: T_1 - Black polythene mulch (30 µ), T_2 - Silver polythene mulch (30 µ), T_3 - White polythene mulch (30 µ), T_4 - Paddy straw mulch (10 cm), T_5 - Sawdust mulch (10 cm), T_6 - Coconut chopped leaves mulch (10 cm), T_7 - No mulch (weeded check), T_8 - Control (unweeded check).

Cauliflower seeds were sown in pro-trays with sterilized coco peat and treated with carbendazim for disease protection. Germination occurred within 3-4 days, with regular irrigation. Seedlings were drenched with Ridomil MZ to prevent damping-off. After 25-30 days, healthy seedlings were transplanted onto raised beds (12 × 1 m) prepared by deep ploughing, harrowing, and levelling. Beds were mulched with inorganic and organic mulches. Transplanting was done in the evening at 60 × 60 cm plant spacing, followed by immediate irrigation. The crop was irrigated through drip irrigation. Weeded check was maintained with two hand weedings at 20 and 40 days after transplanting.

The growth and yield performance of cauliflower were evaluated using key morphological and reproductive parameters. Vegetative traits assessed included plant height, number of leaves, plant spread and leaf area, while reproductive and yield attributes comprised curd length, curd weight, curd volume, curd diameter and overall curd yield. All collected data were subjected to statistical analysis to determine the effects of organic and inorganic mulches on the growth and yield of cauliflower under the experimental conditions.

Results and Discussion

Growth Attributes

White polythene mulch (T_3) consistently produced the maximum plant height (17.22 cm at 20 DAT, 31.44 cm at 40 DAT and 52.9 cm at harvest) and more number of leaves per plant (11.78, 15.56 and 22.62, respectively), followed by paddy straw (T_4), sawdust (T_5), and black polythene (T_1), while the un weeded control (T_8) recorded the lowest growth. The superior performance of white polythene mulch is attributed to its reflective surface, creating a stable and favourable microclimate around the root zone. The improved light distribution and reduced weed competition under white mulch stimulate photosynthetic activity.

Table 1: Plant height (cm) and Number of leaves per plant of cauliflower at different crop growth stages as influenced by different types of mulches

Treatments	Plant height (cm)			Number of leaves per plant		
	20 DAT	40 DAT	At harvest	20 DAT	40 DAT	At harvest
T_1 : Black polythene mulch (30 µ)	13.45	29.62	46.45	11.02	13.78	20.24
T_2 : Silver polythene mulch (30 µ)	16.81	27.25	48.49	11.10	13.71	21.33
T_3 : White polythene mulch (30 µ)	17.22	31.44	52.86	11.78	15.56	22.62
T_4 : Paddy straw mulch (10 cm)	16.98	30.48	49.86	11.23	13.86	21.83
T_5 : Sawdust mulch (10 cm)	16.74	29.61	46.16	11.00	13.11	21.01
T_6 : Coconut leaves mulch (10 cm)	14.30	26.24	41.24	10.67	12.30	20.10
T_7 : No mulch (weeded check)	12.50	25.49	38.80	10.11	11.89	19.56
T_8 : Control (un weeded check)	9.14	15.57	30.51	8.90	9.50	15.70
S.Em.±	0.256	0.509	0.861	0.219	0.452	0.726
CD @ 5%	0.776	1.542	2.613	0.664	0.981	1.321

Paddy straw provided moderate benefits through insulation and moisture retention, whereas the control might have exposed plants to higher soil temperatures and rapid moisture loss, limiting growth. These results are in consistent with previous findings of Zhang *et al*. (2021) [20] in garlic, Mohammed *et al*. (2016) [9] in broccoli, Malik *et al*. (2025) [7] in garlic, Bansod *et al*. (2022) [2] in broccoli, Masarirambi *et al*. (2013) [8] in savoy baby cabbage.

White polythene mulch (T_3) produced the greatest cauliflower plant spread (11.43 cm at 20 DAT, 29.78 cm at 40 DAT and 44.02 cm at harvest) and leaf area (53.82, 168.01 and 231.54 cm², respectively), followed by paddy straw (T_4), silver (T_2), black (T_1) and sawdust (T_5), while the unweeded control (T_8) recorded the lowest values. The superior performance under white polythene mulch is attributed to its reflective surface, which regulates soil temperature, maintains moisture, and promotes lateral root development, canopy expansion, and leaf growth.

Table 2: Plant spread (cm) and leaf area (cm^2) of cauliflower at different crop growth stages as influenced by different types of mulches

Treatments	Plant spread (cm)			Leaf area (cm^2)		
	20 DAT	40 DAT	At harvest	20 DAT	40 DAT	At harvest
T_1 : Black polythene mulch (30 µ)	10.52	27.09	41.24	37.87	152.13	175.12
T_2 : Silver polythene mulch (30 µ)	10.91	28.19	41.53	42.53	151.68	190.35
T_3 : White polythene mulch (30 µ)	11.43	29.78	44.02	53.82	168.01	231.54
T_4 : Paddy straw mulch (10 cm)	11.06	28.06	43.90	45.85	166.35	212.68
T_5 : Sawdust mulch (10 cm)	10.49	24.43	40.37	43.71	146.64	190.14
T_6 : Coconut leaves mulch (10 cm)	9.72	21.98	35.12	33.89	137.34	172.36
T_7 : No mulch (weeded check)	9.51	21.32	34.73	34.63	148.40	168.75
T_8 : Control (un weeded check)	7.25	16.81	30.14	25.04	85.32	102.87
S.Em.±	0.461	0.823	1.287	0.657	5.303	9.154
CD @ 5%	1.212	2.429	3.298	1.993	16.985	24.879

Paddy straw improved soil structure and humidity can be attributed through organic matter decomposition, while silver and black mulches moderately enhanced growth via light and temperature regulation and sawdust conserved moisture but might have limited nitrogen availability. All mulches outperformed the control, consistent with earlier studies done by Masarirambi *et al.* (2013) [8] in savoy baby cabbage, Anuja *et al.* (2023) [1] in cauliflower, Patel *et al.* (2023) [11] in cauliflower, Olivar *et al.* (2016) [17] in cucumber, Singh and Kumar (2017) in broccoli, Bhandari and Bhandari (2021) [3] in broccoli, Bohara *et al.* (2025) [4] in garlic and Subedi *et al.* (2024) [4] in brinjal.

Yield Attributes: Among the mulching treatments, white polythene mulch (T_3) consistently produced the higher values of all yield parameters viz., curd length (14.83 cm), curd weight (550.58 g), curd volume (494.34 cc), curd diameter (15.48 cm) and curd yield (20,789 kg/ha), however it was on par with paddy straw mulch (T_4) for most traits. Silver (T_2), black (T_1) and sawdust (T_5) mulches showed moderate improvements, while the lowest values were recorded in the unweeded control (T_8).

Table 3: Yield attributes of cauliflower as influenced by different types of mulches

Treatments	curd length (cm)	Curd weight (g)	Curd Volume (cc)	Curd diameter (cm)	Curd yield (kg/ha^{-1})
T_1 : Black polythene mulch (30 µ)	12.87	513.62	435.01	14.72	19016
T_2 : Silver polythene mulch (30 µ)	12.21	517.54	450.72	14.92	19167
T_3 : White polythene mulch (30 µ)	14.83	550.58	494.34	15.48	20789
T_4 : Paddy straw (10 cm)	13.92	543.81	473.04	15.19	20140
T_5 : Sawdust (10 cm)	13.01	463.02	266.10	14.62	17137
T_6 : Coconut leaves (10 cm)	11.28	412.71	248.28	13.89	15286
T_7 : No mulch(weeded check)	11.45	332.44	151.69	10.12	12312
T_8 : Control (un weeded check)	9.17	263.14	129.93	7.89	9744
S.Em.±	0.190	4.772	3.951	0.214	232.66
CD @ 5%	0.576	14.472	12.001	0.650	705.71

The superior performance of white mulch can be attributed to its reflective surface, which maintained consistent soil moisture and temperature, reduced heat stress and promoted root efficiency, nutrient uptake and curd development. Paddy straw mulch might have supported the growth through moisture retention and organic matter addition. Whereas, black polythene mulch suppressed the plants by heat trapping. Masarirambi *et al.* (2013) [8] in savoy baby cabbage, Malik *et al.* (2025) [7] in garlic, Patel *et al.* (2023) [11] in cauliflower, Bhandari and Bhandari (2021) [3] in broccoli, Thentu *et al.* (2016) [16] in broccoli, Singh and Kumar *et al.* (2017) [14] in broccoli and Punetha (2020) [12] in broccoli reported similar results.

Economics

Among the treatments tried, (T_3) white polythene mulch resulted in higher gross and net returns (₹5,19,742/ha and ₹3,39,516/ha) and B:C ratio (2.88), followed by (T_2) silver polythene mulch (₹4,79,192/ha, ₹3,07,375/ha and 2.79) and (T_1) black polythene mulch (₹4,75,417/ha, 3,03,600/ha and 2.77). Whereas, the unweeded control (T_8) recorded the lowest gross returns (2,43,608/ha), net returns (₹31,291/ha) and B:C ratio (1.15).

Table 4: Economics of cauliflower as influenced by different types of mulches

Treatments	Gross returns (₹/ha)	Net returns (₹/ha)	B:C ratio
T_1 : Black polythene mulch (30 µ)	4,75,417	2,90,400	2.57
T_2 : Silver polythene mulch (30 µ)	4,79,192	2,94,175	2.59
T_3 : White polythene mulch (30 µ)	5,19,742	3,29,425	2.73
T_4 : Paddy straw (10 cm)	5,03,508	2,15,858	1.75
T_5 : Sawdust (10 cm)	4,28,442	1,67,459	1.64
T_6 : Coconut leaves (10 cm)	3,82,167	1,58,406	1.71
T_7 : No mulch(weeded check)	3,07,808	1,05,491	1.52
T_8 : Control (un weeded check)	2,43,608	89,291	1.58

The economic analysis of mulch treatments revealed clear distinctions in profitability and yield performance. White polythene mulch emerged as the most cost-effective option, demonstrating superior curd yield and financial returns, might be due to its favourable impact on soil microclimate and weed suppression. Similar observations were also made by Malik *et al.* (2025) [7] in garlic and Masarirambi *et al.* (2013) [8] in savoy baby cabbage. Silver and black polythene mulches also performed well, indicating that synthetic mulches enhanced productivity and profitability, in tomato, Tyagi *et al.* (2019) [18] in chilli, Patel *et al.* (2021) [10] in tomato.

Conclusion

White polythene and paddy straw mulches have proven to be highly effective in enhancing the growth and yield of cauliflower, primarily due to their ability to regulate soil temperature, retain moisture, and suppress weed growth. Among these, white polythene mulch stands out not only for its agronomic benefits but also for its economic viability. It reflects sunlight, maintaining optimal soil conditions, and creates a barrier that significantly reduces weed competition, leading to healthier plants and higher curd quality. Although paddy straw mulch contributes organic matter to the soil and supports microbial activity, it requires more labour for application and decomposes quickly, limiting its reuse. In contrast, white polythene mulch is durable, easier to manage, and can be reused across multiple seasons, thereby reducing labour costs and increasing net returns. While both mulches improve crop performance, white polythene offers a cost-effective solution for farmers aiming to maximize profitability in cauliflower cultivation.

References

1. Anuja JK, Silas VJ, Lal M, Kishor B. Effect of organic manure and mulching on growth, yield and quality of cauliflower (*Brassica oleracea* var. *botrytis* L.). Pharma Innov J. 2023;12(7):295-298.
2. Bansod VU, Bhalerao RV, Jadhav MS, Dapurkar ND. Influence of different shades of inorganic mulch and organic mulch on growth attributing traits of broccoli (*Brassica oleracea* L. var. *italica*). Pharma Innov J. 2022;11(12):4310-4312.
3. Bhandari S, Bhandari A. Effect of different mulching materials on growth and yield of broccoli (*Brassica oleracea* var. *italica*). Fundam Appl Agric. 2021;6(3):2653-271.
4. Bohara AK, Saud S, Pokhrel A, Subedi S. Effects of different mulching practices on garlic (*Allium sativum* L.) growth and production. Turk J Agric Food Sci Technol. 2025;13(2):353-358.
5. Kader MA, Senge M, Mojid MA, Nakamura K. Mulching type-induced soil moisture and temperature regimes and water use efficiency of soybean under rain-fed condition in central Japan. Int Soil Water Conserv Res. 2017;5(4):302-308.
6. Kasirajan S, Ngouajio M. Polyethylene and biodegradable mulches for agricultural applications: a review. Agron Sustain Dev. 2012;32(2):501-529.
7. Malik SN, Bibi R, Naseem W, Yunas M, Khan M, Aulakh AM, *et al*. Impact of organic and inorganic mulches on soil properties and growth parameters of garlic. Planta Animalia. 2025;4(1):131-140.
8. Masarirambi MT, Mndzebele ME, Wahome PK, Oseni TO. Effects of white plastic and sawdust mulch on 'Savoy' baby cabbage (*Brassica oleracea* var. *bullata*) growth, yield and soil moisture conservation in summer in Swaziland. Am Eurasian J Agric Environ Sci. 2013;13(2):261-268.
9. Mohammed GH, Sarhanand TZ, Teli JA. Effect of mulching and organic fertilizer on growth, yield and quality of broccoli (*Brassica oleracea* var. *italica*). J Zankoy Sulaimani. 2016;18-19:— [page numbers missing].
10. Patel HF, Attar SK, Makwana AI, Bana JK. Effect of mulching and herbicides on weeds, yield and economics of tomato grown under drip irrigation system. Indian J Weed Sci. 2021;53(2):195-197.
11. Patel NA, Masaye SS, Chaudhari VM, Khasdar ZF, Gaikwad SS. Effect of different type of mulches on growth characteristics of cauliflower var. Pusa Snowball K-1. [Journal name missing]. 2023;—:—.
12. Punetha S. Effect of different mulch materials on growth and yield attributing traits in broccoli (*Brassica oleracea* var. *italica* L.). J Med Plants. 2020;8:81-85.
13. Regar OP, Sharma MK, Ola AL, Shivran BC. Effect of mulching and bio-fertilizers on quality characteristics of sprouting broccoli (*Brassica oleracea* var. *italica* L.). J Pharmacogn Phytochem. 2018;7(2):181-184.
14. Singh R, Kumar J. Impact of different shades of plastic mulch and plant geometry on yield and economics on tender stem broccoli in Punjab, India. Int J Curr Microbiol Appl Sci. 2017;6(11):4228-423.
15. Subudhi R, Das P, Kumar A, Raju JT, Gautam VK, Yadav NK, *et al*. Management. 2025;:35-65. [Journal details missing].
16. Thentu TL, Dutta D, Mudi DD, Saha A. Performance of broccoli (*Brassica oleracea* var. *italica*) under drip irrigation and mulch. J Appl Nat Sci. 2016;8(3):— [page numbers missing].
17. Torres-Olivar V, Valdez-Aguilar LA, Cárdenas-Flores A, Lira-Saldivar H, Hernández-Suárez M, Ibarra-Jiménez L. Effect of colored plastic mulch on growth, yield and nutrient status in cucumber under shade house and open field conditions. J Plant Nutr. 2016;39(14):2144-2152.
18. Tyagi SK, Kulmi GS. Effect of plastic mulch on growth, yield and economics of chilli (*Capsicum annuum* L.) under Nimar plains conditions of Madhya Pradesh. J Krishi Vigyan. 2019;8(1):105-108.
19. Wang LF, Chen J, Shangguan ZP. Yield responses of wheat to mulching practices in dryland farming on the Loess Plateau. PLoS One. 2015;10(5):e0127402.
20. Zhang H, Wang X, Liu Y. The influence of plastic mulch on soil temperature and garlic yield. Hortic Res. 2021;8(1):102-111.