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SHORT COMMUNICATION

Effect of different type of mulches on weed control in cauliflower

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Cauliflower (*Brassica oleracea* var. *botrytis* L.) is an important cool-season vegetable crop valued for its nutritional and economic significance. Weeds represent a significant challenge in Indian agriculture, accounting for approximately 33% of total agricultural losses. China and India dominate global production, contributing over 70% of the total yield, with West Bengal leading within India. The edible curds are highly nutritious, containing 90.8% moisture, 2.6% protein, 1.2% fibre and 4.0% carbohydrates, providing about 30 kcal per 100 grams and also rich in essential minerals. Weed infestation is a major constraint to cauliflower production, causing substantial yield losses through competition for nutrients, moisture, light and space. This intense competition not only stunts crop development but also leads to significant reductions in yield and overall produce quality (Mal et al., 2005). Although manual weeding is effective, increasing labour costs and environmental concerns associated with herbicide use have encouraged the adoption of sustainable weed management practices. In addition to hand weeding and herbicide application, mulching techniques, especially those involving organic and inorganic materials, have been recommended by researchers (Bana et al., 2012) for their efficacy in suppressing weed growth. Considering the above circumstances, this work was undertaken to study the effect of different types of mulches on weed control and yield of cauliflower.

Mulching is a widely adopted cultural practice for improving soil hydrothermal conditions, conserving moisture and suppressing weed growth in vegetable crops. It is a non-chemical agronomic method that involves covering the soil around plants with organic or synthetic materials to enhance growing conditions. Mulches are broadly classified into organic and inorganic types. Organic mulches, derived from plant and animal sources, include materials such as coconut leaves, grass clippings, peat moss, bark chips, rice straw, compost, sugarcane trash, sawdust and animal manures. Inorganic mulches consist

Table 1: Effect of different types of mulching on weed suppression, yield and economics of cauliflower

Treatment	*Weed density (m^{-2})*	*Weed dry weight ($g\ m^{-2}$)*	*Weed control efficiency (%)*	*Weed index (%)*	*Curd yield ($kg\ ha^{-1}$)*	*B:C ratio*
T_1: Black polythene mulch (30 µ)	20.03 (4.58)	5.41 (2.53)	85.13	8.52	19016	2.36
T_2: Silver polythene mulch (30 µ)	23.50 (4.95)	5.90 (2.63)	83.77	7.80	19167	2.38
T_3: White polythene mulch (30 µ)	25.67 (5.16)	6.06 (2.66)	83.35	0.00	20789	2.73
T_4: Paddy straw (10 cm)	72.67 (8.56)	17.89 (4.35)	50.85	3.12	20140	2.12
T_5: Sawdust (10 cm)	98.33 (9.96)	34.36 (5.35)	5.62	17.56	17137	1.71
T_6: Coconut leaves (10 cm)	84.00 (9.17)	26.14 (5.21)	28.13	26.47	15286	1.69
T_7: No mulch (weeded check)	20.67 (4.65)	4.31 (2.31)	88.17	40.78	12312	1.36
T_8: Control (unweeded check)	147.33 (12.16)	36.43 (6.12)	0.00	53.12	9744	1.13
SE m ±	6.87 (0.35)	0.24 (0.02)	0.990	0.362	232.66	0.031
CD @5%	20.83 (1.07)	0.74 (0.06)	3.146	1.099	705.71	0.095

of polyethylene films, aluminium foils, stones and pebbles. Organic mulches enhance soil fertility through the addition of organic matter, while polyethylene mulches effectively modify the crop microclimate, reduce soil evaporation and inhibit weed emergence (Kumar & Kumar, 1990). Today, available colours include black, white, green, brown, red, yellow, silver and blue each designed to affect light absorption and crop physiology differently. The use of coloured plastic mulches has therefore become an integral component of sustainable vegetable production owing to their positive effects on crop growth, resource-use efficiency and weed management (Najafabadi *et al.*, 2012).

A field experiment was conducted during the late *Rabi* season of 2024 at the College of Horticulture, Dr. Y.S.R. Horticultural University, Anantharajupeta, Andhra Pradesh, India. The experiment was laid out in a randomized block design with eight treatments and three replications. The treatments comprised 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). Healthy cauliflower seedlings were transplanted at a spacing of 60 × 60 cm on raised beds under drip irrigation following the recommended package of practices. Weed-check plots were maintained by hand weeding at 20 and 40 days after transplanting. Weed density, weed dry weight, weed control efficiency (WCE), weed index (WI), curd yield and benefit:cost (B:C) ratio were recorded using standard procedures. Experimental data were analysed using analysis of variance (ANOVA) and treatment means were compared at the 5% level of significance.

The minimum total weed density was observed in the black polythene mulch (T_1) (4.58 m^{-2}), which was statistically analogous to no mulch treatment (T_7) (4.65 m^{-2}), Silver polythene mulch (T_2) (4.95 m^{-2}) and white polythene mulch (T_3) (5.16 m^{-2}). Among the organic mulches, paddy straw (T_4) (8.56 m^{-2}) recorded the lowest density, which was statistically inferior to coconut leaves (T_6) (9.17 m^{-2}). The untreated control (T_8) exhibited the highest total weed density (12.16 m^{-2}). The superior performance of black polythene mulch is attributed to its ability to elevate soil temperature and block light penetration, thereby inhibiting weed germination and growth. These findings align with studies done by Mishra et al., 2020; Singh et al., 2024 and Patel et al., 2021. The untreated control plots demonstrated vigorous weed proliferation due to exposed soil surfaces and favorable ecological niches, reinforcing the importance of mulching in integrated weed management. (Figures in parentheses indicate square-root-transformed ($\sqrt{X+0.5}$) values. The minimum total weed dry weight was recorded in the no-mulch treatment (T_7) (2.31 g m^{-2}), which was statistically significant compared to all the treatments tried. The next best treatments were black polythene mulch (T_1) (2.53 g m^{-2}), silver polythene mulch (T_2) (2.63 g m^{-2}) and white polythene mulch (T_3) (2.66 g m^{-2}) (Table 1). Conversely, the untreated control (T_8) registered the maximum total weed dry weight (6.12 g m^{-2}) at harvest. The superior performance of black and silver polythene mulches is attributed to their ability to alter microclimatic conditions reducing light penetration and elevating soil temperature, thereby inhibiting weed germination and growth. Organic mulches offered moderate suppression but were less effective over time due to decomposition and incomplete soil coverage. The untreated control (T_8) consistently recorded the highest weed dry weight at all stages, underscoring the importance of mulching in integrated weed management. These findings align with previous studies in crops such as Patel et al. (2021), Ashrafuzzaman et al. (2011), confirming the efficacy of synthetic mulches in long-term weed suppression (Figures in parentheses indicate square root transformed ($\sqrt{X+0.5}$) values).

The mulching treatments significantly influenced weed control efficiency (WCE). The highest WCE was recorded in the weeded check (T_7) (88.17%), followed by black polythene mulch (T_1) (85.13%), which was statistically comparable with white polythene mulch (T_3) (83.35%) and silver polythene mulch (T_2) (83.77%). In contrast, the unweeded control (T_8) recorded no weed control efficiency (0.00%). The higher WCE under polythene mulches was attributed to effective suppression of weed emergence through reduced light penetration and favourable modification of the soil microenvironment Bana et al. (2012). Weed index (WI) differed significantly among the treatments. The lowest WI was recorded with white polythene mulch (T_3) (0.00%), followed by paddy straw mulch (T_4) (3.12%), silver polythene mulch (T_2) (7.80%) and black polythene mulch (T_1) (8.52%), whereas the unweeded control (T_8) recorded the highest WI (53.12%). Among these, white polythene mulch proved particularly beneficial, likely due to its reflective surface that enhances light distribution and creates a favourable microclimate for crop growth. In contrast, the untreated control recorded the highest weed index, indicating substantial yield reduction resulting from intense weed pressure. The lower weed index under polythene mulches indicates effective weed suppression and reduced yield loss, corroborating the findings of Masarirambi *et al.* (2013).

The mulching treatments significantly influenced curd yield. The highest yield was recorded with white polythene mulch (T_3) (20,789 kg ha^{-1}), which was statistically at par with paddy straw mulch (T_4) (20,140 kg ha^{-1}). Silver polythene mulch (T_2) (19,167 kg ha^{-1}) was comparable with black polythene mulch (T_1) (19,016 kg ha^{-1}), whereas the unweeded control (T_8) produced the lowest yield (9,744 kg ha^{-1}). The superior performance of white polythene mulch may be attributed to improved soil moisture conservation, favourable soil microclimate and reduced weed competition. Similar findings were reported by Masarirambi *et al.* (2013) and Patel *et al.* (2023). The benefit-cost (B:C) ratio varied significantly among the treatments. White polythene mulch (T_3) recorded the highest B:C ratio (2.73), followed by silver polythene mulch (T_2) (2.38) and black polythene mulch (T_1) (2.36), whereas the unweeded control (T_8) recorded the lowest value (1.13). The higher profitability of white polythene mulch was mainly attributed to its superior curd yield and effective weed suppression. Similar findings were reported by Masarirambi *et al*. (2013) and Patel *et al*. (2023).

Mulching treatments significantly influenced weed suppression, yield and economic returns in cauliflower. White polythene mulch was most effective, producing the highest curd yield, weed control efficiency and benefit-cost ratio due to improved soil microclimate and crop growth. Black polythene mulch effectively suppressed weeds but was slightly less productive, possibly from heat stress. Silver polythene and paddy straw mulch also enhanced yield and weed control. Organic mulches offered moderate benefits but declined over time. The untreated control showed maximum weed infestation, lowest yield and poorest profitability.

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