

Effect of different Plastic Mulches on Vegetable Production: Review

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Abstract - Vegetables are valuable in India because it is considered to be biodiversity rich and primary and secondary centers of origin for many vegetables and even for good biological assets as genetic resources even there are many proofs that vegetables play a key role as their importance included in Indian scriptures history and Vedas, Ramayana. Vegetables have much importance as economic, nutritional, medicinal, and industrial and also have employment opportunities. Vegetable production in India accounts for 14% of world production which is cultivated on area of 8.5 million hectares and its average productivity is 17.3 t/ha and it is second largest producer it has a production of 146.55 million in 2017-18. It needs 1.5 times more labor than other crops. Utilization of plastic mulch in business vegetable creation is one of these customary forms that have been utilized it makes a great soil-water-plant connection by setting mulch over the dirt surface. Various shades of plastic mulches have been utilised economically on vegetables since the mid-1970s. Dark, clear & white-on-dark plastic, mulches straight forwardly sway the microclimate around the plant by adjusting the radiation (absorptivity versus reflectivity) of the surface & diminishing the dirt moisture loss. The colour of mulch to a great extent decides its vitality transmitting conduct & its effects on the microclimate around a vegetable plant. Colour affects the surface temperature of the mulch while transparent plastic mulch transmits 85-95 percent solar radiation and raises day soil temperature (4.4-7.8oC). The degree on contact between the mulch and soil, frequently survey the warm contact opposition, can influence extraordinary the exhibition of mulch. In the event that an air space is made between the plastic mulch & the dirt by a tough soil surface, soil warming can be less viable & vacillated than would be normal from specific mulch.

Index Terms - White-on-black plastic, transparent plastic mulch, absorptivity, reflectivity.

INTRODUCTION

Mulching is a cultural practice of protective ground cover that can include organic and synthetic plastics and other natural products. In other terms it is a cultural method which is practiced on the surface of soil by sheathing with any extraneous materials to minimize evaporation, and also to alter wide changes in day soil temperatures, mainly at root area environment. It controls external macro-environment and it simply restrict the direct fall of solar radiation and directly checks the energy supply mainly where there is high evaporations occur. Its main role is limited to controlling of drying which helps in improved moisture status, reduced soil temperature (Loy and Wells, 1975). Besides the above, mulching helps in increasing downward movement of water. Its storage deep in the profile's escapes evaporation by reduction in thermal status and exchange of vapours. The effectiveness of mulches in conserving moisture has generally been found to be higher under more frequency of rainfall, drought conditions and also during early period of plant growth when canopy cover remains scanty. Vegetable production needs huge capital as it requires all heavy cultural practices such that incurring heavy inputs such that irrigation like drip and sprinklers and protective methods from biological organisms by spraying insecticides and pesticides, weeding like cultural methods of control for increasing production.



Fig. 1. Silver plastic mulch



Fig. 2. Black plastic mulch



Fig. 3. white plastic mulch

Moreover, the establishment of seedlings in vegetable field is a tedious job. many views are involved in production of vegetables but some of the important views which are must to consider in idea of beneficial views such as mainly in buffering properties of soil and in conserving soil. In hot dry and semi-bone-dry regions, the acts of plastic mulching in vegetable creation has been prompted in order to put-down the expense of development and acquire quality produce, return boost with expanded benefits. For high-esteem

crops, for example, tomatoes and cucumbers, it is financially savvy to cover the land with substantial paper or plastic sheets to ensure the dirt, spare water, and forestall weed development. Regardless of natural or engineered mulch type utilized in vegetable creation are useful in controlling weed population, reducing soil disintegration, guideline of soil temperature and protection of soil dampness.

Plastic mulch used for various purposes:

1. To improve the fertility of soil.
2. To protect the soil from water and wind erosion.
3. To preserves the soil moisture.
4. To protect the plant and their produce from attack of insect-pest and diseases.
5. To moderate the soil thermal regime throughout the cropping season.
6. To prevent weed growth.
7. Increasing overall crop production

Research uncovered that Plastic mulches influence plant microclimate by adjusting the reflectivity and absorptivity of the dirt around the plant the table below shows the impact of various plastics on soil temperature, radiation and weed control. (Tiffany Maughanand Dan Drost 2016).

Tab:1Effect of different colours of plastic on light and weed control.

Plastic Color	Soil Temp. (2-4'' depth)	Light Reflectivity	Light Absorptivity	Weed Suppression
Black (Fig: -2)	Increases (3 to 5 °F)	Low	High	Excellent
Clear	Increases (6 to 14 °F)	Low	Low	Poor
White/silver (Fig: -1&2)	Decreases (-2 to 0.7 °F)	High	Low	Excellent

The literature available on uses of plastic mulches has been reviewed and presented under the following:

Effect of plastic mulches on Vegetative growth of plants: Mulching essentially advanced vegetative development over the non-mulching treatment. The mulched plots produced plants with greater number of vines, number of leaves, leaf area and vine length. This might be because of acceptable condition balance possibilities of mulching innovation stable dampness substance and great finished soil promoting unlimited extended root development & consequent increment in nutrient retention. This perception affirms the report of Ba (1992) who found that the non-mulched plots delivered cucumber plants with the least plant stature, number of branches, blossoms, and natural products. Menezes et al. (1974), Chung (1987) and Aliudin (1986) announced that mulches preserved more soil

dampness, improved vegetative development and yield contributing characters of garlic. Dark plastic mulch altogether improved plant tallness, number of branches, blossom size and yield (Arora et al., 2002). Lourduraj et al. (1996) expressed that plastic mulching on tomato yield and financial aspects are positively correlated and revealed that black plastic mulch recorded significantly highest plant height (81.5 cm), number of branches per plant (8.6), number of natural products per plant (42), mean fruit weight (31.8 g) and production (12.73 tha⁻¹) when contrasted with natural mulch and no mulch. Significantly higher check of natural products per plant (97.67), length of fruit (6.93 cm), perimeter of fruit (3.57 cm) and yield (8.6 tha⁻¹) were acquired with the utilisation of black plastic mulch compared to organic mulch and no mulch. Reported by Nagalakshmi et al. (2002) in chilli. Sha

and Karuppaiah (2005) conducted an experiment on integrated weed management in brinjal and revealed that black polythene sheet mulching recorded the highest count of flowers per plant (53.57) and fruit production per plant (0.69 kg), which was on par with hand weeding twice, while the fallow recorded the lowest number of flowers (32.54) and fruit yield (0.36 kg) per plant.

Effect of plastic mulch on controlling weeds: Plastic mulch stifles weed development viably and it keeps weeds from getting the daylight required for photosynthesis. At the point when the weeds are denied of daylight, they kick the bucket, which spares you the issue of pulling weeds separately by hand. To struggle every one of these issues in eco-accommodating way, plastic mulching offers compensating potential outcomes as utilization of serious synthetic use prompts aggravation of environmental parity. The compelling strategy for mulching procedure is by covering of soil with various mulch materials for soil and water preservation alongside weed the board (Bobby et al., 2017).

Vijay Pal Singh et al. (2006) revealed that effect of black polythene mulch on growth and fruit yield of tomato, noticed that black plastic mulch significantly reduced the weed population (54.6 m⁻²) and weed dry weight (19.8 gm⁻²), while the highest weed density (265.2 m⁻²) and weed dry weight (137.4 gm⁻²) were recorded in control (without mulch) in tomato. Ashrafuzzaman et al. (2011) while working in chillies reported lowest number of weeds with black plastic mulch (54.25 m⁻²) while highest was (186.5 m⁻²) in transparent plastic mulch.

Yield parameters: Usage of plastic mulches are embraced for huge scope in business creation of vegetables due to their enormous scope landholdings in increasing better return with better quality which may be because of less water dissipation, expanded soil temperatures, less weed pervasion (Coolong, 2010 and Gordon et al., 2008). Dark plastic mulch is compelling in expanding soil temperature (Mahadeen, 2014) and in this manner improved the yield of summer squash by 74% over control (Bhatt et al., 2011

Treatments	No. of Fruits per Plant	Average Fruit Weight (g.)	Yield per Plant (kg)	Fruit Yield (t ha ⁻¹)
M1 - Black plastic mulch	37.36	95.82	3.58	32.26
M2 - Blue plastic mulch	32.42	94.81	3.07	27.67

M3 - Rice straw mulch	25.28	85.02	2.15	19.37
M4 - Transparent mulch	28.58	93.83	2.68	24.13

Fig:2. Difference in yield attributes under different mulch materials in summer squash.

Different coloured plastic mulches have been used to early emergence, growth and maturity of many vegetable crops including tomato and cucumber (Wolfe et al., 1989), Chinese cabbage and beet (Gimenez et al., 2002).

The mulched plants consistently produced the highest number of fruits, diameter of fruits, fruit weight, length of fruit and days to 50% anthesis. Dygima and Demkouma (1986) given eggplant and tomato grown on black polyethylene mulch yielding 3.3 occasions and 2.3 occasions higher than without mulch since it makes great condition for crops (Thakur et al., 2000). Conclusion: From the above reviews it is concluded that use of plastic mulches in vegetables resulted in minimum weed density, maximum weed control efficiency and benefited the crop with highest plant height, most minimal days to taken to blossoming, increasingly number of organic products per plant, normal natural product weight, normal natural product width, organic product yield per plant, organic product yield per bed and natural product yield per hectare., and ultimately resulting in maximum gross returns, net returns of different vegetables. In comparison to other plastic mulches, Black plastic mulch shown significant positive response on growth and yield attributes and so can be recommended on commercial basis in vegetable production.

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