



Mulching, It's Type and Impact on Horticultural Crops

(*Sumit, Gurmeet, Sakshi, Arjoo and Shivani)

Chaudary Charan Singh Haryana Agriculture University, Hisar, Haryana

*Corresponding Author's email: sumitkaleramna@gmail.com

The demand for different horticulture crops has expanded globally in the current environment of globalization and health consciousness. Farmers have been compelled to produce more fruits and vegetables of superior quality in order to compete on the global market due to the rising demand and market competitiveness. An agricultural and horticultural practice called mulching involves the utilization of both organic and inorganic materials. This method is excellent for protecting plant roots from extreme temperatures. In order to promote favourable conditions for growth, mulch is utilized to cover the soil surface around the plants. This might involve regulating the temperature, lowering the salinity, and controlling weeds (Patil *et al.*, 2013). It has a significant impact on the early ripening, yield, and quality of crops. However, where frequent cultivation is not necessary for growing the crops, it is preferred like in fruit orchards, flower and vegetable production, nurseries. According to Singh *et al.* (2011), black plastic mulch is most frequently utilized in agriculture. One practical strategy that could benefit horticulture growers in increasing output of high-quality fruit is the use of organic mulching. The adoption of organic mulching on a wide scale by Indian farmers will help the farmers to overcome a number of problems like water scarcity and the obstacles that arise due to climate change. According to the results of numerous research, mulching with organic materials boosts soil nutrients, maintains the ideal soil temperature, slows the rate of soil surface evaporation, inhibits weed growth, and avoids soil erosion.

Types of mulches

Organic mulches: Organic mulches are made from plant and animal materials such as straw, hay, peanut hulls, leaves, compost, sawdust, wood chips and animal manures. To take maximum advantage from the organic mulch, the mulch should be applied immediately after germination of crop or transplanting of vegetable seedling @ 5 t ha⁻¹. Organic mulch is effective at reducing the leaching of nitrates, improving the physical properties of the soil, preventing erosion, adding organic matter, controlling temperature and water retention, enhancing nitrogen balance, participating in the nutrient cycle and increase microbial activity.

Straw: After harvest, straw from crops like wheat, barley, and rice is commonly available and can be utilized as mulch. Straw mulch is lightweight and simple to utilize. Paddy straw is being utilized to cover fields, improving the conditions for growing crops. When straw is utilized as mulch, certain possible issues may arise like need to be replaced every year, are very combustible, contain germination seeds and degrade to release less nitrogen into the soil.

Bark mulches: Bark mulch is made from pine and cypress by-products. Bark mulches decay slowly, so they won't need to be replaced as frequently as other mulches.

Wood chips: Wood chips are made by recycling used timber and many different kinds of woods. Because wood chip mulches have a high carbon to nitrogen ratio, its decomposition may temporarily lower the amount of soil nitrogen available for plant.

Sawdust: Sawdust is a by-product of the processing of wood. Due to its low nitrogen content, it can degrade like wood chips while draining nitrogen from soil. It is necessary to use nitrogen fertilizer to compensate this loss. Sawdust layers need to be fluffed up and supplied each season due to compaction.

Compost: Compost used in a 2 to 3 inch layer effectively controls weeds. However, most compost offers a favourable environment for weed seeds to germinate. It is a great soil amendment, thus it is probably best used by being applied to the soil. On perennial overwintering beds, like those for asparagus or berries, a layer of compost can be applied to supply nutrients and help in crowns protection (Diane and McDaniel, 2009).

Shredded leaves: Before utilising leaves as mulch, they must be finely chopped. Otherwise, they will form mat and prevent penetrating of free water and oxygen into soil. Mulch breaks down and adds nitrogen and other nutrients to the soil.

Newspapers: Newspaper is a natural mulch that decomposes in the garden. Vegetable plots benefit from the application of newspapers since you can easily plant through them. It has been reported that paper, whether in rolls, sheets, chopped, shredded or pellet form, is an efficient weed-suppressing mulch material. The best time to use it is in the spring. The use of paper mulches, especially those coated with tar or asphalt, reduced weed growth, retained moisture, and warmed the soil, enhancing yields for the majority of warm-season crops.

Seaweeds: If it is freshly collected, seaweed makes great mulch and adds minerals to the soil. When seaweed dries, it shrinks significantly, so a thick covering should be placed in the field. Seaweeds should be sprayed with fresh water before being applied to the ground to reduce the amount of salt that gets into the soil.

Mushroom Compost: Compost made from mushrooms is an organic plant fertiliser that can be found in regions where it should be grown for commercial purposes. It is marketed as spent mushroom substrate or spent mushroom compost. It is fairly affordable. The rich nutrient values of it promote soil fertility. This kind of compost improves the soil's ability to retain water.

Peanut Hulls: This attractive mulch is found close to regions where peanuts are processed. These are the types of organic mulches that are typically utilised as a mulching material in fields. Farmers also use the various crop wastes that are available in the field as mulch (Ranjan *et al.*, 2017).

Inorganic mulches: Plastic mulch is a type of inorganic mulch that makes up the majority of the mulch used in agricultural crop cultivation. Films made of polyethylene or polyvinyl chloride are used as mulch. It can raise the temperature around the plants at night in winter due to its higher permeability to long wave radiation. In order to produce horticultural crops, polyethylene film mulch is preferred as a mulching medium. Several distinct plastic films made of various polymer kinds have all been examined for mulching at various points throughout the 1960s. Although there were some slight differences in their technical performance, LDPE, HDPE, and flexible PVC are commonly used. Because it is more practical to utilise, the great majority of plastic mulch produced now is made from LLDPE. The use of black plastic mulch film is increasing nowadays and it has produced excellent results, especially in dry and semi-arid locations. Mulches made of black polyethylene are used in the organic system of agricultural production to combat weeds in a variety of crops. Black polypropylene woven mulch is generally used with perennials.

Plastic Mulching for Crop Production

An agricultural practise known as "synthetic mulching" involves adding synthetic materials to the soil around plants to create an environment that is more favourable to growth and production. Several distinct plastic films made of various polymer kinds have all been examined for mulching at various points throughout the 1960s. Although there were some

small technical performance differences between low density polyethylene (LDPE), high density polyethylene (HDPE), and flexible polyvinyl chloride (PVC), all of these materials have been used. Polyethylene is preferred because of its higher permeability to long wave radiation, which can raise the temperature around plants at night (Singh and Kamal, 2012).

Types of plastic Mulches

Black Plastic Mulch: Black mulches are often less effective at warming the soil than clear mulch, but they are better at controlling weeds. Soil temperatures under black plastic during the day time can be as much as 50 F higher at a 2-inch depth and 30 F higher at a 4-inch depth than bare soil at the same depths. Mulch made of black plastic reduces soil compaction and is perfect for drip irrigation. Black plastic mulches generally show very low reflectance and transmittance of short wave of short wave radiation, but high transmittance of long wave radiation.

Clear or transparent Mulches: Weeds will grow because the transparent coating will let sunlight through. However, weed growth can be controlled by applying a herbicide coating to the inner surface of the film. The translucent film works well as a soil solarization film to sanitise the soil and prevent the growth of some weeds and diseases that are transmitted through contaminated soil. This method of solarizing the beds prior to seeding them for nursery raising, which results in 100% seed germination and a nursery free of disease, is highly effective. When warm-season vegetable crops are cultivated in regions with a short and cold growing season, clear mulches that raise soil temperatures are highly helpful.

Infrared Transmitting (IRT) Mulch: Infrared transmitting (IRT) mulch is a recent development. These plastics transmit the wavelengths of the light that are warming but not those that encourage weed growth. These mulches result in warmer soils than black plastic, but cooler soils than clear plastics. The growth of weeds, such as nut sedge, is reduced by IRT mulches. IRT mulch will allow crops to mature 7 to 10 days earlier than black plastic (Mallikarjuna Rao, 2015).

Conserve soil moisture: The retention of soil moisture through mulching as a result of the alteration of favourable microclimates in the soil. When organic mulch is applied to the soil's surface, weed development is inhibited, evaporation is decreased and rainwater infiltration throughout the growing season is increased. Additionally, during seasons of high rain, plastic mulch contributes in removing extra water away from the crop root zone. This may assist to decrease the frequency and quantity of irrigation, as well as the occurrence of physiological diseases associated to soil moisture, such as tomato blossom end rot, lime and pomegranate fruit cracking (Bhardwaj, 2013).

The Crop selected to Mulch: Avoid using material as mulch that raises the danger of introducing pests or viruses to the crops. Also, avoid using mulch that contains weed seeds. Organic material should be placed in the late fall, after the soil has been saturated by an initial strong rainfall, or in the late spring, after the soil has warmed and even retained moisture. The earth often gets warm at the start of the rainy season and releases steam as a result. If we put down a large layer of mulch right now, the soil won't be able to release its steam. which can make it more likely for various pests, insects and diseases to develop.

For balancing the soil and mulch to minimizing the risk of occurring of any type of disease, after applying of mulch it can well-watered for 2-3 months before the beginning of rainy season. Also, the best time to applying of mulch is nearby the end of the rainy season. Now the steam in the soil has released but still moisture is available in the soil, which helps the mulch to decomposes into the soil. The moisture will be retained by the mulching material, and it will be used for the plant for many weeks or even months. Also, the best time to applying the mulch are after the bed preparation. Before applying of organic mulch, remove weeds from the field. Ensure that the selected mulching material has free of any weed

seeds. Generally, avoid the mulch material which is contaminated with pesticides or disease. If we apply these materials, they can increase the chances of attack of insects or pest on the cultivated crop. Apply a layer of plain cardboard or a 4-6 pages thick layer of newspaper before using the mulch in field. These applied cardboard or newspaper layer will control annual weed sand, they also help to reduce perennial weeds. If the mulch material is coarser, then it should be applied more thickly. Mostly, a 3-6-inch mulch layer controls most of the annual weeds. The fine mulches less water and air penetration than coarser material.

Effect of Organic Mulching on Vegetative Growth: The application of organic mulch increases the crop growth such as earliness flowering, fruit set and harvesting period also it increased the no. flowers and fruits in tomato crop over control. Maximum plant height and a maximum number of leaves are observed in plots mulched with 4-inch wheat straw. A maximum number of fruits per plant is observed in mulching with grass. The growth and yield of plant were more in drip irrigated crop with mulch than comparing with drip alone. Between the different operation tried, the drip irrigated with straw mulch applied crop was recorded the highest growth in plant height in all the years (Singh *et al.*, 2011) in Brinjal.

Conclusion

Mulching with organic materials increases the soil nutrients, maintains the optimum soil temperature, restrict the rate evaporation from the soil surface, restrict weed growth and prevent soil erosion. It improves all properties of soil like physical, chemical and biological. The organic mulches are decomposing easily and increase the organic content like carbon etc. These organic matters are beneficial for the growth of soil microorganisms and supply food material for their growth. It could maintain the soil moisture and also increases water use efficiency. It not only increases the production but also produces quality fruits. Transparent polyethylene mulch reduces whitefly populations, helps in catching aphids in yellow traps and reduces virus disease incidence. Thus, it is concluded that mulching has various beneficial effects on horticultural crop production, in addition the organic mulch also adds organic matter (3 - 5 t ha⁻¹), stimulates soil micro flora and takes part in nutrient cycle as well as increases the biological activity of soil. It is also concluded that different types of organic and inorganic materials are used for mulching in horticultural crop production but black polyethylene mulch was found to be superior to other mulches and preferred by growers or producers. In view of the available facts, it can be said that water scarcity will be a burning problem for the future and it's most probable solution can definitely be use of mulching for quality production of horticultural crops.

References

1. Diane, R. and Mc Daniel, A. (2009) Mulches for the Home Vegetable Garden. *Virginia Cooperative Extension Publication*, pp. 426-326.
2. Mallikarjuna Rao, K., Ranjit Kumar Das, Saklesh Basavraj and Kanhaiya Lal Sanodiya (2015) Role of Mulching in Vegetable Crop Production. *Trends in Biosciences* 8(11):2855-2866.
3. Patil, S., Kelkar T. S., and Bhalerao S. A. (2013). Mulching: A soil and water conservation practice. *Research Journal of Agriculture and Forestry Sciences*, 1(3), 26-29.
4. Prem Ranjan, G. T. Patle, Manjeet Prem and K R Solanke (2017) Organic Mulching - A Water Saving Technique to Increase the Production of Fruits and Vegetables. *Current Agriculture Research Journal*, 5(3): 371- 380.
5. Raju Lal Bhardwaj (2013) Effect Of Mulching On Crop Production Under Rainfed Condition - A Review. *Agri. Reviews*, 34 (3): 188-197

6. Singh, A.K. and Kamal, S. (2012). Effect of black plastic mulch on soil temperature and tomato yield in mid hills of Garhwal. *Himalayas Journal of Horticulture and Forestry*. 4(4):78- 80.
7. Singh, IS, Awasthi, OP, Sharma, BD, More, TA and Meena, SR (2011). Soil properties, root growth, water-use efficiency in brinjal (*Solanum melongena*) production and economics as affected by soil water conservation practices. *Indian J. Agric. Sci*; 81: 760-763.