

IMPORTANCE OF MULCHING FOR FRUIT PRODUCTION UNDER SEMI-ARID CONDITION

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While the soil surface around the plant is an important management practice in fruit orchard to conserve the soil moisture in the root zone and to create favourable conditions for growth and development of the plant. Mulch is any material which applied to cover soil surface with certain objective. In mulching, crop residues like paddy straw, wheat straw, cotton stalks, leaves, saw dust, polythene films and certain special kinds of paper are spread in the tree basins and in the inter spaces between trees.

Even though Mulching is a general practice for soil moisture conservation and weed control; studies confirmed its effect on regulating soil temperature, improving water use efficiency, crop development and yield (Singh et al., 2005; Yu *et al.*, 2018). Mulching has significant affect on soil microbial population, fruit quality and certain physiological disorder in fruit plants. Mulching enhances porosity of soil which further improves infiltration rate as well as water holding capacity of the soil (Paolo et al., 2009).

Mulching helps not only in soil moisture retention and control temperature fluctuations but also improves physical, chemical and biological properties of soil. Mulching is considered as lifesaving practice for newly established fruit orchards. Because, newly planted seedlings and young fruit plants are highly sensitive to water stress during initial years of establishment. Since the root zone of small plant is confined in the upper layer of soil they can not absorb water from deep soil layers. In this condition mulching is highly beneficial to protect plants from drying. Mulching is pre-requisite for cultivation of fruit crops like strawberry. It significantly improves quality as well as yield of fruit and ultimately higher return to the grower.

TYPES OF MULCHING

Mulch materials are of mainly two types i.e., organic and inorganic.

Organic Mulches: Organic mulches are derived from plant and animal sources. This includes living products such as bark, straw, grass clippings, and other natural products that will decompose. These materials contain nutrients which improve soil quality. However, natural mulch materials are often not available in sufficient quantities for commercial operations or must be transported to the place of use. These organic mulches are environmentally friendly but require more labour to spread in the field. There are several materials such as



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paddy and wheat straw, gram residue, saw dust, tree bark, bamboo matting, grass clippings, leaves, shredded newspaper, hay, woodchips, cardboard, wool, animal manure, corn cobs or stalks, cocoa bean hulls, cottonseed hulls, rice hulls, vermiculite or perlite, nut shells, poultry litter etc. that can be used as organic mulch materials. Continuous use of organic mulches (Figure 1) helps in improving beneficial soil microbial flora, organic matter content and better soil aeration.



Figure 1. Organic mulching in mango orchard

Inorganic Mulches: Inorganic mulches are non-living materials applied to the soil surface such as rock, stone and plastics (Figure 2). They should be removed after a certain period of time because the do not break down into simpler form. Different colours of polythene mulches are used which affect the temperature below and above the mulch through absorption, transmission and reflection of solar energy. This affects soil environment near plant's root zone. The degree of contact between mulch and soil also affects soil warming.



Figure 2. Inorganic mulching in mango crop

Low Density Polyethylene (LDPE) and Linear Low Density Polyethylene (LLDPE) plastic films are commonly used inorganic mulches nowadays. LLDPE black colour mulch film is most popular, owing to the twin properties of down gauging and better puncture availability. Black polythene, transparent polythene, rock, stone, plastic thick films and marble chips etc. are also some inorganic mulching materials.

ADVANTAGES OF MULCHING

There is several beneficial effect of mulching in fruit crops: Some of them are as follows

- It reduces run-off and prevents soil erosion.
- It allows infiltration of more rainwater into the soil and that reduces irrigation frequency.
- It keeps the soil cool in day time and warm during night.
- It suppresses weed growth.
- It decreases soil temperature during the summer and helps plants to grow better.
- It provides a congenial soil environment for root growth.
- Organic mulches decompose and add humus content to the soil, improve soil air space, moisture retention and nutrient holding capacity.
- It reduces disease spread by protecting the trunk from being splashed with soil pathogens.
- It prevents strawberry fruit coming into contact with soil.
- It protects the fallen fruits and keeps them clean.
- It helps to get early production.
- It protects the small plants from freezing injury.
- It protects mango fruits from the physiological disorder like spongy tissue.



DISADVANTAGES OF MULCHING

- Low thickness of organic mulching may not completely reduce the weed population.
- Thick mulches may act as a harbour for rodents to live and multiply. They may damage the trunks by eating and roots by burrowing into the land.
- Dry organic mulch materials encourage the risk of fire and consequent damage to fruit crops
- Plastic mulches cause low water infiltration into soil that results water stress for plants.
- Inorganic mulches do not decompose in the soil and it has to be removed from the field.
- It is labour intensive tasks to cover soil surface with plastic sheet in hot summer and remove it after the harvest.
- Use of plastic mulch increase cost of production.

BENEFICIAL EFFECTS OF MULCHING IN FRUIT ORCHARD

Plant Establishment: Mulching can help to reduce the mortality of young saplings in fruit crops like mango, citrus, and litchi. This is because mulch helps to conserve soil moisture and suppress weed growth, both of which can be detrimental to young plants

Weed Management: Mulching significantly reduces the weed population and eliminate the competition with main crops, and thus, save fuel and labour costs for weed control.

Soil Nutrition: In fruit orchards, organic mulches can help to increase nutrients level in the root zone as it decompose and release nutrient into the soil.

Temperature Maintenance: Mulching can maintain soil temperature in the root zone of the fruit crops and maintain the activity of soil microbes. Black polythene mulches trap the heat and increase soil temperature in winter whereas light colour mulches and organic mulches reduce the soil temperature in summer.

Reduced Evaporation and Salinization: Mulching is beneficial to reduce soil water loss through evaporation that in turn reduces the irrigation frequency and cost of cultivation along with improving water use efficiency. Salt accumulation in soil can be avoided with mulching through preventing upward movement of saline water from deeper layers of soil.

Reduce Pest Populations: Mulches prevent the contact between plants and soil, thusreducing the risk of disease. It also reduces or prevents direct contact between soil and the above-ground portions of the plant. Highly reflective or metalized plastic mulches help to reduce the incidence of white fly, thrips and aphids which acts as vectors for virus and mycoplasma.

Bioremediation of Heavy Metals: Organic mulches can help to remove heavy metals from the soil. This is because organic matter can bind to heavy metals and prevent them from being absorbed by plants. Mulching of eucalyptus (*Eucalyptus spp.*), poplar (*Populus spp.*) and Thuja leaves are helpful to remove elements such as lead and cadamium from soil.

Improve Soil Properties: The continuous use of organic mulches also help in improving beneficial soil microbial flora, organic matter content and better soil aeration. Mulching prevent runoff and soil loss, minimizes the weed infestation and checks the water losses. Organic mulches increase water holding capacity and cation exchange capacity in sandy soil.

Earliness of Fruit: Plastic mulch promotes earliness by capturing heat, which increases soil temperatures and accelerates growth. Higher temperature reduces the phonological period results in early ripening of fruit.

Management of Fruit Drop: Mulching enhances water use efficiency by reducing evaporation from the soil. Water scarcity leads to the synthesis of abscisic acid which causes fruit drop but, water conserving technique like mulching helps in minimizing fruit drop.

Control Physiological Disorder: A physiological disorder in mango due to the convection heat released by soil surface viz., spongy tissue and FRUIT cracking in citrus can be prevented with mulching because; mulching reduces emission of heat from soil surface and conserve soil moisture in the root zones.



CONCLUSION

Mulching not only helps in conserving soil moisture and reducing weed population but also improves fruit quality and yield, and reduces some physiological disorder in fruit crops. It improves the establishment of fruit saplings in the orchards by reducing water stress in the zone and hence increases water use efficiency, moderating the temperature, suppressing the weed growth, improving the physical, chemical and biological properties of soil and controls the soil loss through erosion and these advantages, interacting together, enhancing the growth, yield and quality of fruit crops.

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