

Mulching: A best management practice for soil and water conservation

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Mulch : Mulch is simply a protective layer of any type of material that is spread at surface or vertically in soil to assist conservation of soil, water and productivity or Applying plant residue, or other suitable material produced offsite, to the land surface (NRCS National Handbook of Conservation Practices, 2014). In addition to maintain a uniform soil temperature mulches improve water retention, reduce erosion and compaction from heavy rains and improve the water penetration and also helping to retain existing nutrients.

Mulch is used for a variety of reasons:

Conserve soil moisture:

Uncovered soil exposed to heat, wind, and compaction loses water through evaporation. Mulches add an extra layer between the soil and the sun, reducing evaporation and helping to retain water. The need to water is considerably reduced or eliminated.

Increase organic matter: Organic mulches can increase, decrease or have no effect upon nutrient levels depending on mulch type, soil chemistry, and particular nutrients of interest. Mulches with relatively high nitrogen content often result in higher yields and improve organic matter.

Reduction of weeds: Using mulches for weed control is highly effective. A thick layer of mulch substantially blocks the sunlight from reaching the soil.

Reduced pesticide use: Mulches reduce weeds, plant stress, and susceptibility to pests and pathogens which translates to reduced use of herbicides, insecticides, and fungicides.

Maintenance of optimum soil temperature: Mulches have shown to lower soil temperatures in summer months. Mulches protect soils from extreme temperatures, either cold or hot by provided a layer of insulation, keeping soil temperatures more moderate.

Reduce soil erosion and preserve soil structure : The mulch acts as a protective mat over the ground against

the wind and water erosion. Mulch reduces compaction from footsteps or heavy rainstorms and machinery.

Improved plant establishment and growth: Mulches improve seed germination and seed survival, enhance root establishment, transplant survival, and increase plant performance.

Reduction of disease: Mulches will reduce the splashing

of rain or irrigation water, which can carry spores of disease organisms to stems and leaves of plants.

Feeds the soil food web: Mulching with organic materials as hay and leaves provides the soil organisms with a slow and

steady supply of nourishment. The microorganisms will decompose the mulch materials, making the nutrients available to growing plants.

Soil mulching significantly affected the soil moisture contents (SMC), soil compaction (BD) and soil organic carbon (SOC) (Table 1). Higher SMC, SOC and reduction in BD was observed with mulching as compare to the without mulching.

Types of mulches:

– **Organic mulches:** Materials used for mulches are bark, municipal tree waste, cocoa bean hulls, leaf mulch, grass clippings, composted animal manure, newspaper.

– **Inorganic mulches:** Plastic film (polyethylene), petroleum products, Stone, rubber.

– **Vertical mulch:** Vertical mulch is a technique which consists of digging suitable trenches across the slope and thus making more surface area available for water absorption. The open treaches are likely get silted in short period.

– **Soil mulch :** Soil mulches are created by intensively hoeing the soil surface. According to proponents dust mulching breaks the soil capillarity, reducing the evaporative loss of soil moisture. If the



Table 1 : Effect of mulch on soil physical properties at maize harvest

Treatments	Soil moisture (%)	Soil bulk density (Mgm ⁻³)	Soil strength (kPa)	SOM content (g kh ⁻¹)	
				0-15 cm depth	15-30 cm depth
Mulch @ 0 Mg ha ⁻¹ (M ₀)	14.0c	1.41a	715a	0.650Cc	0.403c
Mulch @ 7 Mg ha ⁻¹ (M ₁)	15.8b	1.39Ab	579b	0.980 b	0.528b
Mulch @ 14 Mg ha ⁻¹ (M ₂)	17.0a	1.35b	464c	1.323a	0.825a

Means followed by different letters are significantly different at P=0.01 and 0.05, level of probability

surface of the soil is loosened, it acts as mulch for reducing evaporation. This loose surface of soil is called soil mulch or dust mulch.

Points to remember while applying mulch:

- To make the work easier, place small piles of mulch throughout the area to be mulched then use a rake to spread the material as evenly as possible.
- A 3-inch layer of mulch in orchard and plantation should block most weeds and help with moisture control. Don't pile it on too thick.
- Mulching will help retain approximately 20-per cent of soil moisture. It will also aid in aeration and compaction.
- Too thick blankets of fine mulch may reduce the penetration of water and air.
- Lay mulches over moist soil, after removing weeds, including their roots, when the soil is not frozen.
- When creating new beds, planting through mulch sheets is effective.
- On wet soils, deep mulch can lead to excess moisture in the root zone, which can stress the plant and cause root rot.
- Some mulch, especially those containing fresh grass clippings, can affect soil pH and may eventually lead to nutrient deficiencies or toxic build ups.
- Mulch piled high against the trunks of young trees may create habitats for rodents that chew the bark and can girdle the trees.

Disadvantages:

- Heavy mulching may result in a build-up of soil over the crown area of plants.
- Mulching is labour-intensive.
- The cost of some materials can be a drawback to large-scale mulching like plastic mulching.
- Mulch material can introduce new pests and diseases into a field.
- Some mulch are not readily available.
- Nitrogen starvation sometimes occurs (using sawdust and woodchips).

Advantages:

- Mulches keep the soil underneath moist longer

Table 2 : General instructions for selecting the correct mulch (TNAU)

Rainy season	Perforated mulch
Orchard and plantation	Thicker mulch
Soil solarization	Thin transparent film
Weed control through solarization	Transparent film
Weed control through in cropped area	Black film
Sandy soil	Black film
Saline water use	Black film
Summer cropped land	White film
Early germination	Thinner film
Insect repellent	Silver colour film

than bare soil and prevent evaporation.

- Reduce soil erosion.
- Reduce compaction and improve aeration.
- Helps maintaining moderate temperature.
- Prevent weed growth.
- Synthetic mulches play a major role in soil solarisation processes.

Conclusion : Mulch is a material spread on top of the soil surface to maintain soil moisture and improve soil condition and productivity. Mulches improve the quality of the soil in the root zone by improving soil structure, especially by increasing porosity. However, improper mulching materials and practices may have little, or even negative, impact on the plant growth and soil quality. The most frequent material used in organic mulching are grass, straw and bark. While the most frequently used material in non- organic mulching are plastic sheet, stones, small chips of brick.

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