

MULCHING

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Abstract

Mulching is a common agricultural and gardening practice that consists of covering the soil surface with a protective layer of organic or inorganic materials. This abstract investigates the importance of mulching in modern agriculture and horticulture, emphasizing its beneficial effects on soil health, moisture conservation, weed suppression, and crop productivity overall. Mulching major goal is to produce a favorable environment for plant growth, prevent soil erosion, and promote sustainability in farming practices. Mulching materials include both organic and inorganic solutions such as straw, wood chips, and compost, as well as plastic and landscape fabric. Each form of mulch has its own set of benefits and downsides, so farmers and gardeners must select the best alternative for their specific needs and environmental concerns. Mulching has the potential to conserve soil moisture by minimizing evaporation and maintaining a steady soil temperature. This is especially important in areas with unpredictable rainfall patterns and water scarcity challenges. Mulching also helps to limit weed development by blocking sunlight and preventing weed seeds from germinating, minimizing the need for chemical herbicides. Organic matter introduced into the soil as a result of mulch decomposition increases soil structure and nutrient content, increasing fertility and long-term sustainability. This process also promotes the activity of helpful microbes, which aid in the decomposition of organic matter and the availability of nutrients to plants. Mulching is a sustainable and environmentally friendly practice that improves agriculture and horticulture in a variety of ways. Because of its beneficial impacts on soil health, moisture conservation, weed control, and crop yield enhancement, it is a vital tool for modern farming and gardening. As the globe faces climate change and resource conservation issues, the use of mulching techniques can play an important role in encouraging sustainable agriculture and guaranteeing food security for future generations.

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Introduction:

The term Mulch was first coined by Waggoner in 1965. It is also known as Sheet Composting. The word “mulch” was probably derived from German word “molsch” which means soft to decay. It has been referred to the gardener's use of straw and leaves, as a soil cover, “Mulching is the process of covering soil around the plant an organic or inorganic material to create congenial condition for the plant growth, development and efficient production”. Mulch' originally means something that is soft and is beginning to decay. Materials that can be used on the soil surface mainly to prevent loss of water by evaporation, to cut down weed growth, to reduce temperature fluctuations, and to promote soil productivity are all designated as Mulch. Mulching is referred to as a mixture of wet straw, leaves, and loose earth evenly spread on the ground to protect the newly planted trees, shrubs, and their roots (Michael, 2017). Tropical areas sometimes use crop residues as Mulch material such as sugar cane trash, banana leaves or elephant grass, etc. Areas under the wet tropics having uniform rainfall distribution use cover crops instead of Mulch materials. Mulch is of extreme use in the dry season, especially during the cultivation of certain crops like sugar cane and coffee. Straw and stalks from cereal crops and fodder crops can be treated as Mulch material

and can be either left on the soil surface or can be incorporated partially into the soil surface (Akhir, 2022).

Mulching is considered to be one of the most beneficial practices a farmer can do to keep his farm healthy (Dentzman, 2020). Basically, Mulching creates a micro-climate for the plant to grow and perform better in an area that has regulated moisture content, suitable temperature, humidity, carbon dioxide, and proper microbial activity within the soil.

Application areas of Mulching:

Mulching is generally applied in the following area of lands:

- In rainfed areas to conserve moisture.
- In areas that need irrigation, Mulching reduces the frequency of irrigation.
- In greenhouses to maintain the soil temperature.
- In areas with soil borne diseases, Mulching is needed for solarisation.
- In heavy rainfall areas to reduce the impact of rain and prevent soil erosion.
- In lands where high-value crops are being cultivated.

Types of mulch and its usefulness

There are different types of mulch but mostly classified as organic and inorganic mulch.

1. Organic or degradable mulch by soil microorganisms.
2. Inorganic or plastic mulch which cannot easily degradable by soil microorganisms.

1. Organic mulch

Organic mulch is that material which found naturally and can be easily decompose by microorganisms. Organic mulch is crops residues, straw, paper or newspaper, dry leaves, grass clipping, peanuts or nut shells, saw dust or wood chip, bark, animals waste or compost, hay and live mulch are used. Organic mulching is more economical in improve soil physical properties, supply organic matter, retain water, weed control, prevent erosion, nitrate leaching reduced, maintain nitrogen balance and increase biological activity within the soil (Stratton, 2020).

Straw and hay

This is the most commonly used Mulch material in agriculture fields because it has a long life when compared to other materials and

they make the soil extremely fertile upon decomposition. Straw and hay reflect light from the surface of the soil and keep it cool. Sometimes there could be a risk of weed growth, but a thick layer of straw can prevent it. It is recommended that nitrogen fertilizer is applied to the soil before straw Mulching because straw is high in carbon content and steals the nitrogen from the soil.

Dry leaves

Dry leaves are easily available and it supply nutrients to soil. Dry leaves are not easily available in spring season. Leaves are lighter so it can blow away by air so put some bark and small branches on it. Sugarcane leaves are used effectively in field for weeds control. Thickness of this mulching should be 3-4 inches but it varies for how long we kept.

(Fig. 3 & 4)

NEW ERA

AGRICULTURE JOURNAL Manure/compost

Compost is the best mulch and soil conditioner. It improves soil physical,



Fig. 1& 2: Straw and Hay Mulching



Fig. 3 & 4: Dry leaves as mulching



Fig. 5 & 6: Compost as mulching

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chemical and biological properties as well as water retention capacity and carbon content in the soil. But it has one disadvantage it contains weed seeds. Its thickness varies from 3-5 inches.

Sawdust

It is a good mulch material where easily available. It is obtained as by-product or waste during wood working operations. It should be used in basic soils having pH greater than 7 because sawdust is acidic in nature.

Its nutrient value is less but contains moisture for long time. (Fig. 7 & 8)

2. Inorganic mulch

Inorganic mulching is nonliving material (carpets, gravels and plastics) that are used for soil protection like erosion and temperature and for weed control soil water reduction and are mostly used for agronomic practices. For commercial crop production inorganic mulching are used it is mostly including plastic mulch.



Fig. 7 & 8: Saw dust as mulch

Polyethylene and poly vinyl are used as plastic mulch. For production of horticultural crops polyethylene film are used. World largest plastic film consumer for crop production in china which use for insect pest control, reduce flooding and drought or heat and cold.

Plastic Mulch

Plastic mulches are completely impermeable to water; it therefore prevents direct evaporation of moisture from the soil and thus limits the water losses and soil

erosion over the surface. In this manner it plays a positive role in water conservation. The suppression of evaporation also has a supplementary effect; it prevents the rise of water containing salt, which is important in countries with high salt content water resources.

Basic properties of mulch film

- Air proof so as not to permit any moisture vapour to escape.
- Thermal proof for preservation of



Fig. 9 & 10: Plastic Mulching

temperature and prevention of evaporation.

- Durable at least for one crop season

Rubber Mulch

Rubber mulch is a form of mulching material derived from recycled rubber, most commonly used rubber tyres. Because of its durability and safety advantages, it has gained favour in landscaping and playground applications.

Landscape fabric

Landscape fabric, also known as weed fabric or weed barrier cloth, is a material commonly used in landscaping and gardening to control weed growth, conserve soil moisture, and protect the soil surface.

Mulching effect on crop production

In crop production transpiration increases because evaporation is reducing due to mulching which efficiently water and nutrient translocation increases. Crop residues management on farm increase grain quality and grain yield of wheat, rice, sorghum and maize crop by improving water conservation and soil fertility. Temperature and moisture increases which increase root growth and ultimately increases plant growth and development.

Mulching effect on soil properties

Soil moisture conservation

In arid and semi-arid region moisture conservation and increase water use efficiency

are key factor in crop production. With little rain straw mulching increase soil moisture and reduces evaporation and improves moisture at the depth of 0-40 cm as compared with traditional tillage method.

Soil organic matter

In soils of low fertility proper mulching and irrigation successfully increase the crop production. Organic mulch added organic matter in soil and also provide them nutrients and improve soil physical, chemical and biological properties and remain soil loose and soft root penetration easily take place. When more organic mulch is applied more will be the organic matter. Plot mulched with sun hemp waste contain (0.71%) organic carbon content, silkworm bed waste (0.68%), paddy straw (0.66%) and non-mulched plot (0.48%) organic carbon content.

Soil temperature maintains

Soil temperature means temperature of the soil in root zone and it is directly related to root growth. During winter season when temperature is very low or below freezing point water within the plant cells expand which cause injury within cell and causes rupture of cell. While in summer season when temperature is high mostly water evaporate which causes drought condition for plant and causes wilt. Mulching reduces upper soil temperature in rice, maize and spring wheat.

Soil microorganisms

Soil microbial biodiversity play important role in soil structure and microbial diversity in agro ecosystem. Rich source of carbon is organic mulch which is directly required by microbes for their proper growth and multiplication when their growth is higher they perform their activity fast, break more organic matter and provide important plant nutrients. Sufficient moisture under mulched soil have significant role in soil reactions and water use efficiency by crops which manage biological nitrogen fixation.

Mulching effect on weed control

Covering the soil surface with mulch control the germination and emergence of weed the main purpose of soil covering is to cut the light of weeds which control its growth and emergence. All inorganic and organic type of mulching is barrier for weeds.

Advantages of Mulching

- Limits weed growth by preventing light from reaching the soil surface.
- Limits water loss from the soil surface, maintaining soil moisture.
- Decreases soil temperatures and keeps it cooler on hot days and warmer on cold nights.
- Covers and protects the soil by reducing soil compaction and erosion.
- Protects plants from the severe winter conditions, including freezing, thawing, and winds.
- Soil below mulch will be warmer as compared to unprotected soil in winters. This protects plants from the pattern of freezing and thawing which can lead to drawing them out of the ground.
- Prevents layering over the soil surface. Water movement is more active into soil covered with mulch rather than running off.
- Prevents soil from splashing onto leaves; this limits the probability of plants getting bacterial and fungal diseases.
- Organic mulch helps to break down and feed the soil.
- Boost the structure of clay soils and the moisture-retention capability of sandy soils.
- Organic mulch slowly increases soil fertility and may improve the availability of already present micronutrients in the soil.
- Warms the soil in spring enabling the gardener to plant, days or weeks prior to the soil needs to get ready.

- Keeps plants off the ground and clean especially melons and tomatoes, to prevent plant diseases.
- Reduces the possibility of damaging trunks of trees when mulch is applied around them in place of grass.
- Enhances plant health and growth leading to fewer weeds and more constant moisture and soil temperature.

Disadvantages of Mulching

Even though using mulch has many benefits, in some cases, it can prove to be detrimental to your lawn or garden:

- Excessive mulch that is a layer more than 3 inches deep can suffocate and bury plants. In this case, oxygen and water are unable to reach the roots. A layer of 2 to 3 inches of mulch is enough. Do not over mulch.
- Mulch can be responsible for rotting bark if accumulation around the shrubs and trunks of trees. Mulch should be placed 6 to 12 inches away from the base of woody plants. Placing mulch away from the trunk inhibits gnawing rodents, wood-boring insects, and decay.
- Applying mulch near plant stems becomes the ideal place for tunneling rodents, slugs, snails, and more pests to inhabit. Sprinkle diatomaceous earth or

wood ashes around the base of precious plants to keep away snails and slugs.

- Your plants can be baked with excess heat in midsummer if mulch is not applied properly.
- Wood-based mulches, such as fresh wood chips or sawdust, can take away nitrogen from the soil as they break down. Nullify this effect by adding a nitrogen-rich fertilizer, like alfalfa, cottonseed meal or soybean meal to the mulch.

Conclusion

Mulching is a valuable practice in gardening, agriculture, and landscaping, offering a range of benefits to both plants and soil health. The choice of mulching material depends on various factors, including the type of plants or crops being grown, climate conditions, and aesthetic preferences. The choice of mulching material should be made carefully, considering the specific needs of your garden or landscape. Organic mulches contribute organic matter to the soil, which can improve its long-term health, while inorganic mulches offer durability and low maintenance. Regardless of the material chosen, mulching plays a critical role in promoting healthy plant growth, reducing the need for herbicides, conserving water, and enhancing overall soil quality. By selecting the right mulch for your

unique circumstances, you can create a more sustainable and productive environment for your plants and garden.

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