

<https://doi.org/10.48047/AFJBS.6.15.2024.7922-7929>



African Journal of Biological Sciences

Journal homepage: <http://www.afjbs.com>



Research Paper

Open Access

Influence of various organic mulch materials used in agriculture

Thulisekari Prasanna¹, Dwaram Mrudula², Burra Shyamsunder³, Guntimadugu Sanhthosh Kumar Raju⁴, Shende Amit Basveshwar⁵, Mohammad Afrose⁶

Research Scholar, Dept of Agronomy, SR Univeristy , Warangal,India

Research Scholar, Dept of Agronomy, SR Univeristy , Warangal, India.

School of Agriculture, Lovely Professional University, Phagwara, Punjab-144411.

School of Agriculture, Lovely Professional University, Phagwara, Punjab-144411.

Research Scholar, Dept of Agronomy, SR Univeristy , Warangal, India

School of Agriculture,Chaitanya Deemed University,Warangal,India

Corresponding Author Email: prasannathulisehari7498@gmail.com

Volume 6, Issue 15, Sep 2024

Received: 15 July 2024

Accepted: 25 Aug 2024

Published: 05 Sep 2024

doi: [10.48047/AFJBS.6.15.2024.7922-7929](https://doi.org/10.48047/AFJBS.6.15.2024.7922-7929)

Abstract

Annual weeds can be controlled with organic mulch, which also provides other crucial advantages including organic matter, nutrients, moisture retention, soil defence, and temperature regulation of the soil. Costs and labour involved in application, limited effectiveness against perennial weeds, a delay in soil warming, and the ability to spread weed seeds and harbour pests are drawbacks. The most adaptable and often utilized organic mulches include hay, straw, and freshly cut forage or cover crops. They are relatively simple to use, limit evaporative losses of soil moisture while enabling rainfall to reach the soil, can suppress weed germination and emergence when applied at appropriate rates, and offer other advantages. It is important to exercise caution to prevent bringing weed seeds or herbicide residues into the farm with the hay. This article explores in greater depth the properties, uses, advantages, and disadvantages of a variety of organic mulch materials.

Keywords:- weeds, residues, cover crops, rainfall, mulch materials

Introduction:

Grain straw, old or new hay, freshly cut forage or cover crops, chipped brush, wood shavings, tree leaves, cotton gin waste, rice or buckwheat hulls, and other crop residues are examples of organic mulch materials. One of the most popular organic mulches in organic horticulture is hay, followed by straw. For no-till planting, cover crops can be cultivated to maturity (flowering), mechanically killed, and then left on the soil's surface as an organic

mulch. Compost, aged manure, and leaf mould (decomposed tree leaves) have also been used as organic mulches, although because of their crumbly structure, they might not be as efficient at blocking the growth of weeds as other materials.

Weeds are prevented by organic mulch in a number of ways. They begin by preventing light from reaching the soil, lowering soil temperature, and significantly reducing day-night temperature variations. Therefore, fewer weed seeds sprout beneath the mulch than on bare soil. Second, when weeds do germinate, the mulch physically prevents their emergence. The confined seedlings eventually perish if the mulch is too thick to allow light to reach them. Third, a process called as allelopathy occurs when some mulch materials, such as grain straw and freshly cut forages like sorghum-sudangrass, produce organic compounds that prevent the growth of weed seedlings for several weeks after application. Finally, by retaining soil moisture and regulating soil temperature, organic mulch can improve crop development and competitiveness against weeds. While grasses and large-seeded broadleaf weeds may require a greater thickness of material than small-seeded broadleaf weeds, which have more delicate seedlings, straw and other organic mulches successfully impede the emergence of most weeds sprouting from seed. Most organic mulches can be penetrated by perennial weeds that grow from rootstocks, rhizomes, tubers, or other vegetative propagules. Before applying mulch, weeds that have already emerged should be hoed away or cultivated; it is less effective to simply sprinkle the organic materials over weeds that have already emerged. The weeds will grow quickly after they break through the mulch because they will benefit from it in the same ways as the crop. However, weeds will ultimately raise through organic mulch. Many times, these late-emerging weeds are shaded out by fast-growing, canopy-forming field crops. To maintain effective weed control in slower-growing, less competitive vegetables, hand weeding or the addition of more mulch may be necessary. Weeds are a special category of pests that severely limit agricultural yield on any extent. They are an active network to crop output losses because they compete with the crops for nutrients, air, light, and moisture. The use of synthetic chemicals by farmers to reduce losses from weeds, pests, and illnesses has a number of negative impacts on the environment and human health. While many areas throughout the world just see herbicides as the major weed management tool, non-chemical approaches are increasingly recognised for their many benefits to both people and the environment. Alternative weed control techniques are encouraged for the protection of human health, the environment, and the avoidance of weeds that are herbicide-resistant. Due to the use of organic manure, mulches, and biomass, which promote weed development and multiplication, weed challenges are even more severe in organic farming. In order to manage weeds without synthetic pesticides and chemicals that stimulate weed suppression rather than weed eradication, an organic weed management system comprised of cultural, mechanical, biological, and physical approaches had to be developed. Mulching is one of the alternate approaches to eliminate the limitations of weed management using chemicals. Mulching is the practise of applying different cover materials to the soil's surface in order to reduce weed growth, retain moisture, and enhance crop production. Mulches would potentially reduce weed populations by shading them and act as evapotranspiration barriers. The germination of small-seeded weed species is decreased when mulch is placed to the soil surface because it acts as a barrier to light. By lowering the rate of evaporation and altering the soil surface's ability to absorb water, mulches help to prevent weed growth in addition to keep the soil wet.

Materials and methodology:

Due to the limited supply of ingredients and labor-intensive nature of application techniques, organic mulches are mainly used in backyard gardens and smaller truck gardening activities. In addition to warming the soil and controlling perennial weeds, organic mulches offer many of the benefits from most synthetic mulches. Compared to synthetic mulches, however, organic mulches including hay, straw, grass clippings, and compost have the capacity to return nutrients to the soil through decomposition. The decision of which mulch to employ is influenced by a number of factors, including availability, quality, crop being mulched, and

season. Mulch can be made of any material that efficiently serves to protect, promotes gaseous exchange, and allows moisture to penetrate. The qualities of a good mulch include not harming plants, being simple to apply, and free of disease and weed seeds, not being very absorbent so as to restrict plants of moisture, and being simple to remove or biodegradable once absorbed into the soil after application.

Types of organic mulches used:

Corn stalks: Shredded cornstalks or complete stalks spread over other mulches in vegetable gardens and/or fields work extremely well. They create great mulch over the winter.

Following the harvest of your corn, give the stalks some time to die down. Allow them to stand until some of their green has faded. Even as they begin to wither, you can still plant beneath them. In fact, it looks good to let them sit in the dirt for a while. More importantly, though, it aids in the return of some of those used nutrients to the soil. Lift your plants out of the ground once they have lost some of their green and slice them into small pieces. This will hasten their decomposition. You can either mulch them around your plants or plough them into your beds. Both of these techniques will assist in restoring organic matter.



Plate no. 01 Corn stalks

Manure: Combine straw with well-rotted or composted manure for best results, but be cautious of weed seed. By providing all the necessary nutrients, through Mulch Farmyard Manure and enhances the condition of your soil on fields. Suitable for fertilising required fields, planter beds, and improving clay soils, poor-quality soils.



Plate 02. Farm yard manure

Dry Leaves: This mulch performs best around vegetable plants and on bare plots when the leaves fall. If you can, shred the leaves to stop them from packing. Mulch made of leaves

requires multiple layers to be laid down. Lay out a pile of leaves on the bottom of your compost bin to start. Maintain a pile height of about six inches.



Plate no. 03 Dry leaves

Sawdust : By lowering the temperature and maintaining a moderate level of soil moisture throughout the growing season, Spread sawdust 1 inch thick, sawdust mulch encouraged the alteration of the soil microclimate. In comparison to bare soil and foil mulch, the relationship between the physical, chemical, and biological aspects of the soil in black currants under sawdust mulch helped to boost fruit yield and bush growth. Black foil mulch, on the other hand, allowed for early soil warming and increased soil temperature and moisture during the growing season, which had a negative impact on the parameters that were being examined. The outcomes showed that sawdust mulching is a successful technique for increasing black currants growth and productivity.



Plate no. 04 Sawdust

Straw: Under various tillage techniques, water use effectiveness and crop productivity are also examined. However, straw mulching can also result in an increase in pests and illnesses and alter the makeup of the soil's microbial community. It can also enhance the amount of organic matter in the soil, regulate soil moisture, and minimise water loss and drought. Mulching straw

can greatly improve production and WUE (water usage efficiency). While reducing tillage preserves soil integrity, which is beneficial for water and soil conservation, it may have a detrimental effect on crop production and WUE. In addition to ensuring a high crop yield, precise field management practises that are implemented in accordance with local conditions and crop varieties also maintain the environment. The paths between planting crop rows, and for winter protection can both benefit from straw as a magnificent all-purpose mulch. The biggest disadvantage is that it could contain weed seed.



Plate no. 05 Straw

Wood chips or shredded bark:

Bark mulch is recycled tree bark that has been shredded. The majority come straight from trees and those who deal with them. Other suppliers include, among others, furniture producers and sawmills. It is an absorbent mulch that is available as flakes. The tiny particle can frequently be packed with slivers and is readily matted together, yet it looks fantastic in a landscape. This is what you'll find in community gardens. Although often made of finely chopped material like pine shavings, shredded wood mulch may be coloured. Typically, this is a finer mulch that is 1" or smaller in size, which makes it highly appealing from a visual standpoint.

Generally speaking, properly placed wood chip mulch may be a fantastic source of nutrients for your soil or compost pile. Wood chips also prevent soil erosion, limit weed growth, and retain water in the soil. Because wood chip mulch retains water, it's an excellent way to stop muck from growing in your garden. If you can manage to color-coordinate, it looks beautiful in any terrain. Arborist wood chips, for example, may even be free. Mulching can be done naturally by covering the soil with a layer of wood chips, preventing grass from growing around trees, or filling muddy patches. Modified wood chips help prevent pests from entering the garden, promoting regular, healthy growth. Grass can be pleasantly contrasted by shrubs that are encircled by a covering of red stuff. Traditional mulches like wood chips or shredded bark are both traditional materials that decay gradually, therefore particular gardens should be taken into account.



Plate no.06 Wood chip or shredded barks

Living Mulch: A living mulch is a cover crop that is interplanted or undersown with a primary crop in agriculture. Its objective is to fulfil the functions of a mulch, such as weed control and soil temperature management. While cover crops are either assimilated into the soil or eliminated using herbicides, living mulches continue to grow alongside the primary crops for a considerable amount of time.

Mulches also help prevent soil erosion from wind and water and reduce the growth of weeds. It has been discovered that some live mulches boost populations of agricultural pests' natural antagonists. In addition to fixing nitrogen, legumes can be utilised as living mulch to lessen the requirement for fertiliser.

Cover crops add nutrients to the soil when they are ploughed under, reducing the need for chemical fertiliser on the main crop. The biomass, which varies over time and is influenced by rainfall and other factors, determines how much of a contribution is made. The rate of terrestrial nutrient turnover increases with biomass. Cover crops made of legumes recycle atmospheric nitrogen. According to reports, legumes have greater foliar nitrogen concentrations overall, ranging from 20 to 45 mg g⁻¹.

Due to extensive tillage, bare soil can result in soil erosion, nutrient losses, and pesticide off-site migration. Weeds can also grow and germinate in the absence of opposition. Living mulches can prevent pollution from entering streams, lessen erosion, and reduce water runoff. Living mulches have also been proven to boost the number of organisms that act as some crop pests' natural enemies.

A maize and soybean rotation with alfalfa and kura clover living mulches had higher populations of ground-dwelling predators than one without. This condition was caused in part by a change in the agricultural system's vegetation composition.



Plate no.07 Grass clippings

Peat moss: Organic material that has decomposed naturally in cold, swampy habitats is called peat moss. The cold peatlands of Canada and the northern United States are the source of the majority of peat moss sold in the northern hemisphere.

Peat moss is a mixture of fibrous material recovered from cold weather wetlands, not a specific plant species. Sphagnum moss is the most prevalent plant component of peat moss. As a result, some peat moss is sold in stores under the name sphagnum peat moss.

Peat moss is the material used to create this attractive, controllable, but quite expensive mulch. Dry peat moss should only be buried three inches deep or less in drought-prone areas since it takes a long time and a lot of water to get moist. Its acidic pH is particularly advantageous to plants that prefer acidity.

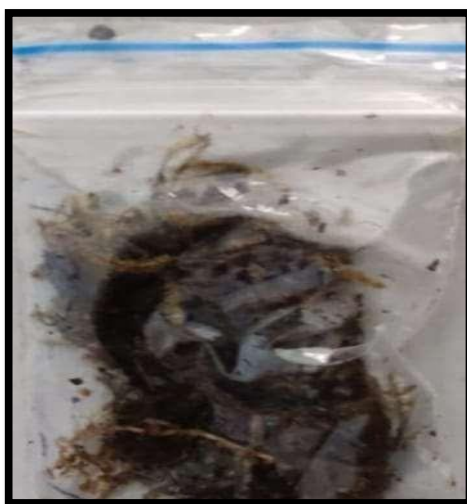


Plate no. 08 Peat moss

Conclusion:

During a drought, mulching is crucial to the life of your crops. Mulch will significantly reduce your need to water your plants because it will decrease the amount of water that evaporates from your soil. Mulch enhances soil quality by dissolving clay and facilitating improved water and air flow through the soil. Sandalwood soil gains nutrients through mulch, which also increases its capacity to retain water. Mulch keeps soil cooler in the summer by acting as an insulating layer on top of it. roots in that way! Mulch discourages the growth of weeds and makes it much simpler to remove or by hand pull easily.

References:

Lehmann J, J.P. da Silva, Jr. L. Trujillo, K. Uguen 2000 Legume cover crops and nutrient cycling in tropical fruit tree production *Acta Horticulturae* 531: 35-72.

Hartwig N.L., H.. Ammon 2002 Cover crops and living mulches *Weed Sci.* 50: 688-699

Prafiska J. R, N. P Schmidt, and K.A Kohler, 2006 Effects of living mulches on predator abundance and sentinel prey in a corn-soybean-forage rotation *Env. Entomology* 35: 1423-1431

Andow 1991. Vegetational diversity and arthropod population response. *Annu. Rev. Entomol.* 36: 561- 586.

Dr. Mark Schonbeck.,(2015). Organic Mulching Materials for Weed Management. Virginia Association for Biological Farming.(available online at <https://eorganic.org/node/4871>).

<https://omasgardens.com/>

M., Paunović & Milinković, Mira & Pesakovic, Marijana. (2020). Effect of Sawdust and Foil Mulches on Soil Properties, Growth and Yield of Black Currant. *Erwerbs-Obstbau*. 10.1007/s10341-020-00522-w.

<https://www.masterclass.com>

Du, Changliang, Lingling Li, and Zechariah Effah. 2022. "Effects of Straw Mulching and Reduced Tillage on Crop Production and Environment: A Review" *Water* 14, no. 16: 2471. <https://doi.org/10.3390/w14162471>

Mishra, P., Sahoo, T. R., Rahman, F. H., Garnayak, L. M., Phonglosa, A., Mohapatra, N., ... & Mishra, S. N. Yield and Economics of Brinjal (*Solanum melongena*) as Affected by Different Mulching Types and Its Effect on Soil Moisture Content and Weed Dynamics in Post Flood Situation of Coastal Odisha, India.

Patil Shirish, S., Kelkar Tushar, S., & Bhalerao Satish, A. (2013). Mulching: a soil and water conservation practice. *Research Journal of Agriculture and Forestry Sciences* ISSN, 2320, 6063.