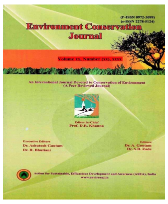
Environment Conservation Journal 24 (3):283--295, 2023

Journal homepage: https://www.environcj.in/

Environment Conservation Journal

ISSN 0972-3099 (Print) 2278-5124 (Online)



Mulching: A diversified and multipurpose input in agriculture

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ARTICLE INFO

Received : 11 August 2022
Revised : 17 January 2023
Accepted : 06 March 2023

Available online: 26 June 2023

Key Words:
Agriculture
Inorganic
Mulching
Organic

ABSTRACT

The ever-growing demand for food has led to the depletion of natural resources. Water scarcity, land degradation, and climate change are the main factors contributing to declining crop productivity. To address this issue, there is a need to adopt suitable agronomic strategies. Mulching is one way this practice addresses this issue. Since time immemorial, people have been using organic residues as mulching material. Nowadays, people find it cumbersome to utilise crop residues. The development of plastic mulching material overcame this issue due to its easy and plentiful availability. Plastic mulch has its own advantages and disadvantages. In today's world, the haphazard use of this material has led to the threat of micro plastics. Micro plastics are small in size and escape waste management practices. They contaminate ecosystems, clog the soil pores, enter the food chain, and take a very long time to degrade. So, balanced use of both organic and inorganic materials is the need of the day. This article reviews the benefits of mulching as an agronomic strategy to boost present-day agriculture.

Introduction

The increasing demand for natural resources like water and soil is being caused by the growing global population, climate change, and global warming (Colak *et al.,* 2015). Due to lower precipitation and higher evaporation rates, some regions of the world have experienced challenges with water scarcity (Li *et al.,* 2000). Mulch is a crucial agronomic practice that is defined as the materials that are put in opposition to the soil profile to cover the soil's surface. It is a method of water conservation that increases the soil's capacity to absorb water, slows soil erosion, and so lowers surface runoff (Chalker-Scott, 2007; Adekalu *et al.,* 2007). It raises the soil's surface temperature, makes the soil more fertile, modifies the microbial biomass, and improves soil quality, all of which promote seed germination, root growth, and plant development and raise agricultural yields in regions with minimal water input (An *et al.,* 2015; Huo *et al.,* 2017; Qiu *et al.,* 2014; Siczek *et al.,* 2015; Wang *et al.,* 2016; Zhang *et al.,* 2016; Gao *et al.,* 2019). Mulching increases soil enzyme activity, which creates favourable conditions for plant metabolism, eradicates weed infestation, and lowers weed biomass and density (Masciandaro *et al.,* 2004; Splawski *et al.,*2016).

What is mulching?Mulching is the technique of covering the soil's surface with plastics, organic

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Doi: https://doi.org/10.36953/ECJ.14352435

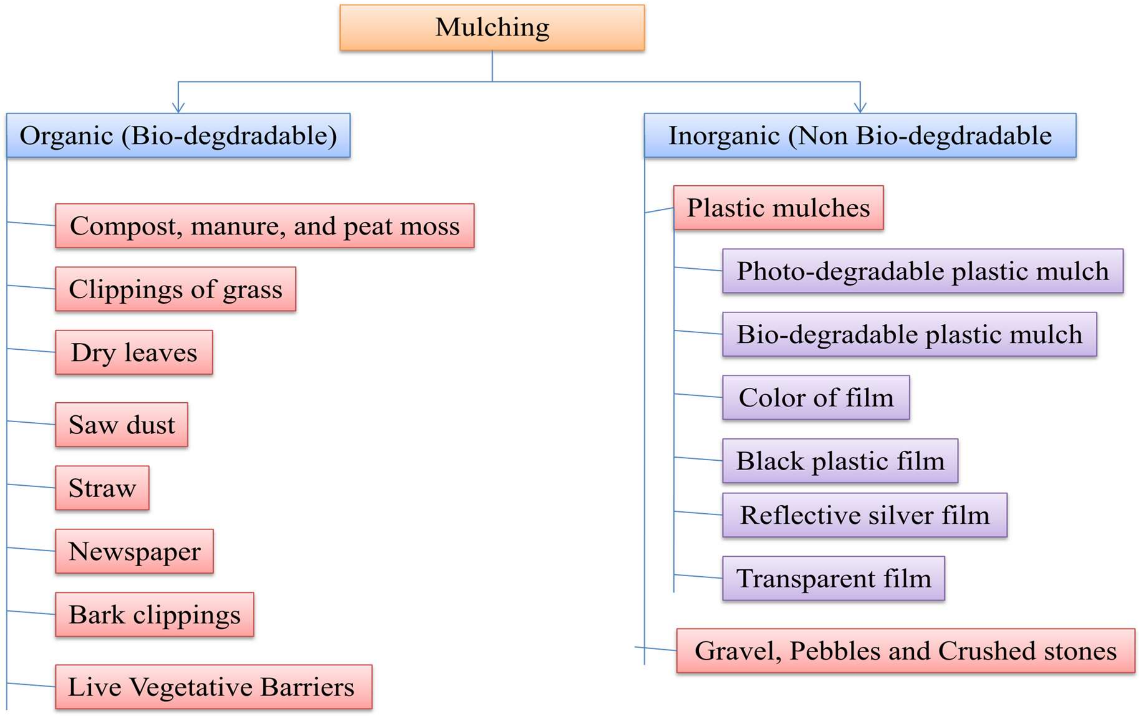

Figure 1: Classification of mulching materials based on their composition/degradability

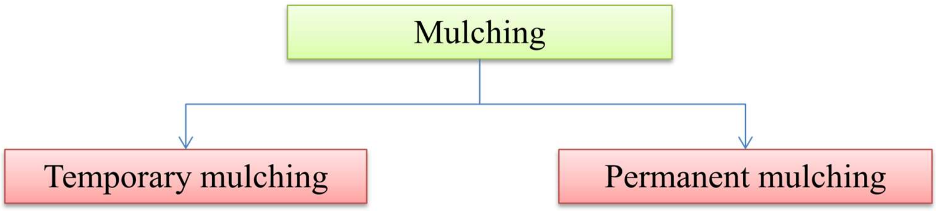

Figure 2: Classification of mulching materials based on their duration

materials, and non-organic materials in order to prevent evaporation and mitigate significant diurnal temperature changes, especially in the root zone environment. The word "mulch" is thought to be originated from the German word "molsch," which means "soft to decay," and appears to refer to the use of straw and leaves as mulch by gardeners(Jacks *et al.,* 1955).

Advantages of mulching

It has influence on crop productivity directly by improving the growth and yield of crops and indirectly by reducing weed density, water conservation (reduced evaporation, runoff and more infiltration), soil temperature regulation, nutrient cycling and improved microbial population in soil.

Different mulching material in agriculture

Mulches are divided into two types based on their composition: organic and inorganic mulches (Fig. 1).

Organic mulching has many advantages:

1. Weed germination is hindered when organic mulch is covered with soil because they do not receive the light they require for germination and growth.
2. Organic mulch is essential for reflecting solar energy. This keeps the soil colder and reduces evaporation.
3. Mulches that have been placed to the soil slow down rainwater flow and increase the quantity of water that the soil can hold. Additionally,

greater water in the soil means that the crops will receive more water.
4. Due to the fact that it is not directly in contact with wind or water, which would otherwise blow or wash it away, it also reduces soil erosion.
5. Organic mulches help to improve the soil's condition. This improves root growth, water infiltration, and soil water-holding capacity.
6. It creates a very good porous soil by maintaining a more even soil temperature.

Organic Mulching has a few drawbacks:
1. Some mulch, such as hay and straw, contain seeds that can grow into weeds.
2. Mulches can keep the soil too moist on poorly drained soils, which reduces the amount of oxygen available to roots.
3. When mulch is used in close proximity to or directly on the stem, retained moisture produces an ideal habitat for disease and pest development.

2) Inorganic mulches:

These mulches have no soil-enhancing qualities (adding fertilizers). Inorganic mulches are usually made of plastic.

a. Plastic mulches-

Plastic mulches can be highly useful as evaporation control mulches if cost is not an issue. Both dark and transparent coatings are frequently used for mulching. Plastic chemistry advancements have resulted in the fabrication of films with optical qualities that are ideal for a certain crop in a specific region (Steinmetz *et al.,* 2016).

The thickness of the plastic is determined by the duration of the crop.

Annuals (short-term crops) have a thickness of 20 to 25 microns.

Biennials (short-term) with a thickness of 40 to 50 microns.

Perennials (long-term crops) have a thickness of 50-100 microns.

Benefits of inorganic mulches:
1. Long lasting compared to organic mulches. Up to 2 to 3 season plastic mulches can be used.
2. Most effective in soil solarisation by increasing the soil temperature**.**

Limitations of inorganic mulches:
1. Many times inorganic mulches may not be available locally.
2. Laborious during setting and removing plastic mulch compared to organic mulches.
3. Non biodegradable which may pollute the soil.

Mulching can be done on a long-term or ad hoc basis. Based on this mulches can be divided into temporary mulches and permanent mulches.

Temporary mulches: - The goal of temporary mulch is to reduce erosion by applying a layer of mulch to damaged areas that will not receive permanent stabilization for a length of time or that may be disturbed at a later date.

Preparation of temporary mulch-
- In a large mixing bowl, combine the mulching materials with the compost.
- Plow the land using this mixture. They can be mulched after crops have been planted or used on fallow land.
- As the plants grow, the mulch will decompose. Potatoes, onions, and garlic, for example.

Permanent mulches: Before planting the crop, the mulches are laid down for a long time. A layer of well-rotted compost, decomposed biomass, and fresh biomass is placed in the soil and seeds or saplings are planted into it to create permanent mulch. Once or twice a year, new mulch can be added.

Permanent mulch preparation-
- Plow the land and add compost.
- Add a 3-inch layer of semi-decomposed biomass, such as straw, litter, leaves, and so on, on top of it.
- For each layer, water it.
- Add fresh, green biomass to the top of the decomposed biomass. Weeds (no seeds), pruned plant parts, and so on.
- For each layer, water it.
- It's all set to be planted. Use a stick to dig a hole for planting.

Methodology

This review article is prepared to synthesize the works conducted in mulching. Keywords like mulching, organic mulches, plastic mulches, and types of mulches were used to search research articles. Once the papers were collected, only the papers published after 2010 were used to review the results of the work. The theoretical background on mulching is described, including the benefits and different types of mulches available, as well as the

Table 1: Advantages and disadvantages of biodegradable non-biodegradable mulches

Biodegradable		Non-biodegradable	
Advantages	**Disadvantages**	**Advantages**	**Disadvantages**
After use, the components are intended to be incorporated into the soil and broken down by residing microbes.	Bulky nature of the organic mulches leading to costlier handling and transportation charges.	Cheap, simple to process, incredibly strong, and adaptable (Kasirajan and Ngouajio, 2012)	Serious environmental contamination
Polymers used in biodegradable plastic mulches contain polysaccharides which are amenable to microbial hydrolysis (Brodhagen *et al.,* 2015).	Lignin rich materials degrade after several years.	Modify soil temperatures, conserve soil moisture and reduce weed pressure, ultimately improving crop productivity (Martin-Closas *et al.,* 2017)	Never entirely removed from a field, leaving behind traces that persist in the soil for decades (Briassoulis *et al.,* 2015).
Facilitates nutrient availability, supports the carbon cycle, and collects rainfall.	Chances of nutrient fixation due to imbalanced/ improper C: N ratio leading to nutrient deficiency in crops.	Inert chemically	In addition to potentially entering the food chain, plastic pieces can physically alter soil.
Increases the amount of soil moisture, prevents soil erosion, slows down moisture evaporation and moderates soil profile temperature. (Bhale and Wanjari, 2009, Ram *et al*., 2012).			Pollute soil (Wang *et al.,* 2015)

Table 2: Influence of mulches on yield of cereal crops

SN	Crop	Yield increase	Mulch material	Authors
1	Quality protein maize (QPM)	77.079	Water hyacinth	Khan and Parvej, 2010
2	Sugarcane	84.17	Black, polyethylene sheet	Ahmed *et al*., 2013
		44.09	Red polyethylene sheet	
		25.47	Green polyethylene sheet	
3	Wheat	20		Wei *et al*., 2015
	Maize	60		
4	Wheat	3.04	Maize straw	Abdul *et al*., 2019
5	Wheat	67.00 to 122.80	Plastic mulch	Zhang *et al.,* 2022
	Maize	148.4 to 237.8		
6	Wheat	3.23 and 2.35	Straw mulch	Prabhjot *et al.,* 2020
7	Maize	12.12 and 8.38	Wheat straw	De and Bandyopadhyay, 2013
8	Maize	15.9 to 16.5	Straw mulch	Rakesh, 2015
9	Maize and wheat	15.82 and 39.51		Priya and Sashidhara, 2016
10	Maize	13.88 (cob) and 12.22 (grain yield)	*Centrosema pubescens* mulch	Nkiruka *et al*., 2020
11	Sweet corn	2.96 (Fresh ear yield)	Plastic mulch	Kara and Atar, 2013

pros and cons of using mulches. For better clarity, the results of the experiments were summarized by organising the papers into categories based on crop types (cereals, pulses, oilseeds, fruits, vegetables, and quality), soil properties (physicochemical and biological properties), and other related factors (moisture content and nutrient release/availability). The results are converted to percentage changes in order to make the interpretation of the results uniform. The gaps in existing research are identified, and the areas for future research are also mentioned.

Influence of mulches on growth and yield of cereal crops-

Mulching has a significant benefit in terms of increasing total yield. Mulching techniques influence cereal yield. Table 2 shows the increase in yields of various cereals with various mulching materials. Improved soil temperature, reduced weed growth, and improved soil moisture conservation can all contribute to increased yields (Chalfant *et al.,* 1977).

Table 3: Influence of mulches on yield of pulse crops

SN	Crop	Yield increase (%)	Mulch material	Authors
1	Chickpea	18	Straw mulching	Reghar *et al*., 2010
2	Soybean	35.18	Rice straw mulch	Eid *et al*., 2013
		58.33	200 mm black Plastic mulch	
3	Pigeonpea	2.20	Soil mulch	Mathukia *et al*., 2015
		17.64	Wheat straw mulch	
		12.63	Groundnut shell mulch	
		6.10	Weed mulch	
4	Summer groundnut	31.99	Black polythene mulch	Kamble *et al*., 2018
		46.69	Transparent polythene mulch	
		17.22	Soybean straw mulch	
5	Groundnut	27.12	Transparent 7 micron polythene	Mousumi *et al*., 2018
6	Lentil	4.16	Rice straw mulch	Mandal *et al*., 2018
7	Soybean	43.28 to 83.64	Rice straw, rice husk and their combinations and polythene sheet	Anand *et al*., 2020
8	Pigeonpea	39.56	Wheat straw	Jadav *et al*., 2020
		48.01	Plastic mulch of 25 micron	
9.	Soybean	7.69	*Centrosema pubescen* weed mulch	Nkiruka *et al*., 2020

Table 4: Influence of mulches on yield of oilseed crops

SN	Crop	Yield increase (%)	Mulch material	Authors
1.	Niger	3.18	Soil dust	Mandal and Saren, 2012
		10.75	Rice straw	
		16.34	Black polythene	
2.	Groundnut	24.41	-	Zayton *et al*., 2014
3.	Mustard	48.7 to 134.00	Rice straw	Saikia *et al*., 2014
4.	Niger	4.75	Soil dust mulching	Sudeshna *et al*., 2015
		13.00	Rice straw mulch on seeded rows	
		19.72	Rice straw mulch between rows	
5	Linseed	5.55	Water hyacinth	Sarkar and Sarkar, 2017
		11.46	Straw mulch	
		14.76	Black polythene	
6.	Sunflower	More than 3 times	Plastic mulch	Kumar *et al*., 2018
7.	Toria mustard	13.88	Groundnut haulm mulch	Chaudhry and Bhagawati, 2019

Influence of mulches on yield of pulse crops-
Mulching practises not only boost cereal crop yields, but they also boost pulse crop yields. This could be owing to improved weed control, resource efficiency, and dry matter buildup during vegetative growth and photosynthetic mobilisation from source to sink (Anand *et al.,* 2020). Table 3 demonstrates the increase in grain yields with different mulching materials.

Influence of mulches on yield of oilseed crops
Table 4 presents the yield increase caused by various mulch types. Mulches preserved more soil moisture through greater penetration and retention while suffocating weed growth, resulting in improved crop growth and development as well as increased yield in all oilseed crops (Teame *et al.,* 2017).

Influence of mulches on yield of vegetable crops
Horticulture crops such as vegetables and fruits, like agricultural crops, respond well to mulching. Tables 5 and 6 show the level of yield augmentation of various vegetables and fruits under various mulch materials.

Influence of soil physico chemical properties
According to Kahlon *et al.* (2013), the application of wheat straw mulch at increasing rate from 0 to 16 mg/ha decreased the bulk density of soil (mg/m^3) from 1.46 to 1.31, 1.45 to 1.36 and 1.50 to 1.47 and increased steady infiltration rate (cm/h) from 3.1 to 4.6, 2.3 to 3.5 and 1.2 to 2.1, saturated hydraulic conductivity ($\times$ 10^{-2} cm/h) from 1.78 to 3.37, 1.57 to 2.95 and 1.37 to 2.28, mean weight

diameter (mm) from 0.36, 0.29 and 0.25 to 1.21, 0.84 and 0.62, respectively, water stable aggregates (%) from 52.7 to 77.4, 43.7 to 66.6, and 39.5 to 59.5 and total carbon (%) from 1.26 to 1.50, 1.20 to 1.47 and 0.95 to 1.10 under no, reduced and plow till, respectively in the first 10 cm soil depth. The infiltration rate and water retention increased linearly. Pervaiz *et al.* (2009) concluded that increasing the mulching rates from 0 to 14 Mg/ha increased the soil moisture content of the soil by 21.42 per cent, decreased the bulk density and soil strength by 4.25 and 35.10 per cent, respectively. In the 0–15 and 15–30 cm soil depths, the organic matter in soil increased by 103.53 and 104.71 per cent, respectively. There was a 28.10, 22.35 and 9.47 per cent increase in the post-harvest soil NPK.

Jordán *et al.* (2010) recorded that there was an increase in soil organic matter content, total porosity, wilting point, field capacity, Saturation, available water, Saturated conductivity (mm/h) 2025, 100, 30.34, 28.47, 50.48, 25.69, 657.62 per cent and decrease in bulk density (g/cm^3), run off (mm/h), steady state run off (mm/h) and sediment concentration (g/L) by 8.96, 96.45, 95.73 and 97.70 per cent**,** respectively.

Influence of mulches on soil biological properties and nutrient release/ release pattern

Siczek and Frac (2012) observed that mulching increased the bacteria number (108 cfu/kg) by 34.54, 26.95 and 73.91 per cent, dehydrogenases (cm^3 H_2/kg/d) by 41.17, 24.59 and 38.23 per cent, protease (mg tyrosine/kg/h) by 27.58, 1.23and 56.25 per cent, alkaline phosphatases (mmol PNP/kg/h) by 46.34, 149.46 and 21.73 per cent and acid phosphatases (mmol PNP/kg/h) by 124.43, 21.16 and 66.14 per cent under no, moderate and strong compaction situations, respectively. Plastic film mulching enhanced the relative abundances of *Proteobacteria* and *Actinobacteria* over a 28-year period in Shenyang, China (Farmer *et al.,* 2017).

Ibrahim (2018) concluded that 15.0, 0.6, and 29.0 kg/ha of N, P and K was released from millet straw, respectively compared to the 32.0 kg/ha, 1.0 kg/ha, and 29.0 kg/ha of N, P and K released from the acacia cuttings treatment. Similarly, 35 and 33 per cent increase in grain yield was observed, respectively. The balance between increased root development and exudate secretion and microbial degradation and loss to CO_2 determines how plastic affects soil organic carbon (SOC) (Wien *et al.*, 1993; Nan *et al.*, 2016).

Influence of different mulching moisture content of soil

Mulching is a water-saving practice used in rain-fed agriculture to assist alleviates water scarcity. It's necessary for keeping soil moist, reducing evaporation, and regulating soil temperature, all of which have an impact on food production. Mulching has emerged as a critical component of agricultural output in recent years. Mulching has a number of strategic implications for the soil ecosystem, crop growth, and climate.

In order to maintain soil moisture, control soil temperature, and reduce soil evaporation, all of which have an effect on crop productivity, mulching is essential (Yang *et al*., 2015; Kader *et al.,* 2017). Mulch protects the soil by acting as insulation against the cold and heat, helping to create stunning and secure landscapes. Wheat straw mulch is less effective than plastic sheet mulch at preserving soil moisture (Li *et al*., 2013). The amount of water saved by mulching is yet unknown due to the interaction of microclimate, soil environment, and plant growths (Steinmetz *et al.,* 2016).

Mulching shortens the time it takes to harvest

Mulching produces early maturation and higher yields in warm-season plants such cucumbers, muskmelons, watermelons, eggplant, and peppers. The early maturity is most likely attributable to the preservation of favourable temperatures throughout the growing season. Apply black mulch to the planting bed prior planting to warm the soil and encourage quicker growth in the early season, for getting an earlier harvest (Tarara, 2000 and Lamont, 2005). In comparison to the control, organic mulches caused earlier blooming, lesser days to set fruits, and early harvest in the tomato crop (Ravinderkumar and Srivastava, 1998). Mulching with polyethylene films has been found to shorten the growing season and boost yield and earliness in a number of vegetable crops (Goreta *et al*., 2005; McCann *et al.,* 2007). The early harvest and improved productivity of watermelon, zucchini, tomatoes, and peppers were all positively impacted by polyethylene mulch, according to research by Romic *et al.* and Walters in 2003, Hutton and Handley (2007).

Table 5: Influence of mulches on yield of vegetable crops

SN	Crop	Yield increase (%)	Mulch material	Authors
1.	Tomato	45.52	Red plastic	Agrawal *et al.,* 2010
		40.06	Black plastic	
		35.30	White plastic	
2.	Chilli	37.07	Transparent,	Ashrafuzzaman *et al.*, 2011
		58.46	Black	
		42.27	Blue mulch	
3.	Potato	48.40 to 85.15	Plastic film mulch	Zhao *et al.,* 2012
4.	Tomato	21.7 to 29.8	Plastic mulching	Singh and Kamal, 2012
5.	Potato	30	Plastic mulch	Xie *et al.,* 2012
6.	Brinjal	27.07 to 77.44	Straw mulch	Pirboneth *et al.*, 2012
7.	Cucumber	67.68	Wheat straw	El- Shaikh and Fouda, 2015
		109.15	Black	
		124.77	Yellow	
		129.26	Transparent	
8.	Potato	3.82	FYM mulch	Dhiman, 2017
		32.41	Rice straw mulch	
		30.33	Rice stubble mulch	
9.	Chilli	16.18 and 37.48	Organic mulch @ 9 and 12 t/ha	Narayan *et al.*, 2017
		220.80	Double coated black polythene (30 micron)	
		65.37	double coated white polythene (30 micron)	
		117.80	30 micron single coated black polythene	
10.	Tomato	50.66	Black mulch,	Sunil, 2018
		44.54	Transparent mulch	
		22.14	Straw mulch	
11.	Potato	14.64	Rice straw	Bharati *et al.*, 2020
		10.04	Saw dust	
		6.69	Rice husk	
		39.33	Black plastic	

Table 6: Influence of mulches on yield of fruit crops

SN	Crop	Yield increase (%)	Mulch material	Authors
1.	Strawberry	63.94	Paddy straw	Bakshi *et al.*, 2014
		56.72	Wheat straw	
		37.13	Grass cuttings	
		38.34	Saw dust	
		91.29	Transparent polythene	
		138.09	Black polythene sheet	
2.	Sapota	7.62 to 41.00	Plastic mulch	Tiwari *et al.*, 2016
3.	Strawberry	38.05	Rice husk	Pandey *et al.*, 2016
		118.41	White polythene	
		145.13	Black polythene mulch	
4.	Watermelon	17	Plastic sheet mulching	Nodar *et al.*, 2016
5.	Watermelon	39.32	Paddy straw	Rao *et al.*, 2017
		61.39	Yellow mulch	
		67.60	Pink mulch	
		79.68	Blue mulch	
		94.90	Red mulch	
		111.88	Black mulch	
		132.33	Silver mulch	
6.	Summer squash	86.68	Black plastic sheets	Dinesh and Rishu, 2017
		60.12	Blue plastic sheets	
		12.09	Rice straw material	
		39.64	Transparent sheets	
7.	Watermelon	12.87	Wheat straw	Dadheech *et al.,* 2018
		13.75	Grasses	
		50.62	Black mulch	
		59.19	Silver mulch	
		36.03	Red mulch,	
		31.35	Blue mulch	
		17.18	Yellow mulch	
8.	Squash melon	26.6	Plastic	Birbal *et al.*, 2019
		48.60	Straw mulching	

Table 7: Influence of mulching on moisture content of soil

SN	Crop	Change in Soil moisture content (%)	Mulch material	Authors
1.	Eureka lemon	23.55 to 51.53 (0-15 cm)	Bajra straw, Maize straw Grasses, Brankad, FYM and Black polyethylene	Kumar *et al*., 2015
		19.76 to 49.90 (15-30 cm)		
2.	Okra	-	-	Mahammed and Singh, 2015
3.	Watermelon	1.26	-	Dadheech *et al.,* 2018
4.	Maize	20.4	Plastic mulch	Wang *et al.,* 2022
		13.9	Sand mulch	
		12.2	Alternate plastic mulch	

Table 8: Economics of different moisture conservation materials

Sl. No.	Crop	B: C ratio	Mulch material	Scientist
1.	Pearlmillet	2.38	*Tephrosia* mulch	Meena and Bhaduri, 2007
		2.23	Dust	
		2.12	Mustard mulch	
		0.86	Black polythene mulch	
2.	Tomato	1.76	Red plastic mulch	Agrawal *et al*., 2010
		1.61	Black plastic mulch	
		1.47	White plastic mulch	
		0.78	Control	
3.	Tomato	2.49	Black polyethylene mulch	Sunil, 2018
		2.05	Transparent polyethylene mulch	
4.	Potato	2.01	Black plastic	Bharati *etal*., 2020
		1.64	Rice husk	

Mulch and quality

Mulch keeps fruits clean by preventing them from touching the ground, and in many cases, it also helps to prevent soil rot, fruit cracking, and blossom end rot. Smoother fruits with fewer scars are more common. Plastic mulch, when properly installed, prevents soil from splashing onto plants during heavy rains, reducing grading time. Tomatoes, cucumbers, muskmelons, and eggplant yields and chemical compositions were discovered to be improved. Early potatoes, cabbage, and other vegetables can benefit from straw mulch in terms of yield and quality of storage. Mulching has been shown to have a favourable effect on the production and quality characteristics of practically all fruit crops in a number of studies. Here are some relevant findings to back up the viewpoint.

Chan *et al.* (2010) looked at the effect of composted mulch on grape quality metrics. Brix increased from 24.13 to 24.16, and titrable acidity increased from 3.94 to 3.99. The greatest TSS (10.43%), reducing sugars (1.80%), total sugar (5.47%), and non-reducing sugar (3.67%) of all the mulching treatments were found in treatment in black mulch, according to Parmar *et al*. (2013). While no mulch contained the least amount of sugar found in watermelon fruit.

Future line of work:

Aside from these, there is a need to investigate alternative mulching materials such as biodegradable films and recycled mulches. The impact of mulching on carbon sequestration and its impact on microbial activity can be studied. Mitigating the effects of climate change by managing soil erosion, soil temperature, and soil moisture. Identify the optimal mulching practices for different crops, soil types, and climates. Study the biodiversity and ecological resilience and the management of soil-borne diseases in different cropping systems. Identify the most effective types and thicknesses of mulch for controlling different weed species, promoting plant growth and yield, reducing soil compaction, improving soil structure, and promoting crop quality. Mulching can affect pest populations by altering the microclimate and soil conditions, but the effects on different pest species are not well understood. Identify the optimal types and thicknesses of mulch for different soil types and slopes to achieve maximum erosion control. Mulching can impact greenhouse gas emissions from the soil by affecting soil organic matter decomposition and nutrient cycling. Further research is needed to understand how different types of mulch and mulching practices can impact greenhouse gas emissions. Identify the social and economic impacts of different mulching practices on farmers and communities. The effects of mulching in high-rainfall areas can be studied. The removal of plastic residues from plastic mulches in the ecosystem through enzymatic degradation or any other mechanism must be developed.

Conclusion
Diverse mulches play an important role in increasing grain, pulse, oilseed, fruit, and vegetable yields, according to the evidence obtained in this review study. Increased weed populations and weed management with chemical herbicides are widely known to damage crop quality. Mulching alters the soil's microclimate, reduces evaporation rates, increases soil moisture and regulates soil temperature; boosts the rhizospheric microbial population; alters the soil's physico-chemical properties; and keeps pests and weeds at bay. All of these favourable impacts promote plant growth and development. Incorporating inorganic mulch into soil comes with its own set of issues in terms of material cost and disposal. Contrarily, organic mulch is widely accessible, affordable, and decreases labour costs while also adding nutrients to the soil that are vital for plant growth and development when it decomposes. Furthermore, the use of bioplastic in agriculture has been promoted in order to address the issues associated with organic mulches as well as the environmental concerns associated with plastic mulches. Also, suitable technologies must be developed to decontaminate the ecosystem which is already polluted with microplastics. This report will provide farmers and manufacturers with a wealth of useful information, allowing them to apply suitable mulch to boost yields.

Conflict of interest
The authors declare that they have no conflict of interest.

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