



## Importance of Mulching as a Soil and Water Conservative Practice in Fruit and Vegetable Production-Review

**M.Govindappa**

College of Sericulture, Chintamani,  
Chikkaballapuradist

**Pallavi**

College of Sericulture, Chintamani,  
Chikkaballapuradist

**C. Seenappa**

College of Sericulture, Chintamani,  
Chikkaballapuradist

**Abstract:** The crop production activity was governed by many resource factors among them the major are soil and water. The yield was dependent on type of soil and its fertility status, pattern of nutrient release into root rhizosphere region. The presence of soil moisture facilitates easy nutrients release into soil rooting media, mitigation of soil moisture stress. This was achieved by the practice of different methods of mulching. Mulching is the processes of spreading different types of mulches include Organic, inorganic and plastic sheets. Mulches are used in the cropping rows so as the basal part of plant is completely covered. The mulching was highly advantageous in crop production with minimized soil moisture transpiration, weed control, optimum soil temperature, increase in soil microbial activity and soil organic carbon. Mulching was proved in the increase of soil moisture content and decrease in the soil erosion, increase in the soil structure and decrease in the weed growth. Mulching was achieved the higher yield levels in both fruit crops and vegetable crops. The percentage yield increase in fruit crops was ranges from 12.61 to 64.24 percent and in vegetable crops it was from 17.39 to 60.74 percent. However, mulching has some few disadvantages. It is not feasible in wetland conditions, Practicing in highly steep areas was difficult and some grass species become the weed menace in crop production. The present review looks up on the different mulches, their advantages and their effect on the yield.

**Keywords:** Crop Production, Soil, Water, Mulching, Improved Soil Structure, Organic Carbon.

### 1. INTRODUCTION

India has made immense development in agriculture and food security. Prior to our first green revolution, India relied on the imports and food aid to meet the domestic food requirement. However, two years of severe drought in 1965 and 1966, convinced India to reform its agricultural development and policy. Then afterwards India adopted significant policy reforms focusing on the goal of food grain self sufficiency and it has been achieved by the green revolution. It began with the decision to adopt superior yielding, disease and pest resistant wheat varieties in combination with improved farming techniques to improve and increase the yield and productivity. Development of irrigation facilities, copious use of chemical and synthetic fertilizers and pesticides, use of high yielding varieties made the green revolution to occur. But the population of India is ever increasing even though the annual birth rate slightly decrease but the requirement of the food is ever increasing and meeting the food security of all the Indian citizens was yet to achieve. To

achieve this we need to go for one more green revolution which should be highly economical and sustainable with the consistent production of yield.

But, after the adoption of high yielding varieties and usage of excess dosage of chemical fertilizers has resulted in the degradation of the soil health and environmental pollution due to discharged chemicals and pesticides. In order to minimize these environmental effects we should adopt the conservation practices are more essential in order to obtain the sustained and consistent yields with the conservation of soil and water. The sustained yield is achieved by the conservation of soil and water in conservation farming. The conservation farming is nothing but the Organic farming-wherein all the bio-degradable organic wastes are re-used as mulches and also as the nutrients recycling. It is helpful and advantageous in crop production. The restoration of soil health and addition of plant nutrients to the soil and improvement of the microbial population and also the organic carbon content.

The word mulch was probably derived from the German word "molch" means soft to decay, which apparently referred to the gardener's use of straw and leaves as a spread over the ground surface as mulch.

The practice of mulching reduces the deterioration of soil by controlling the rate of movement of water and its runoff. It also reduces the soil erosion, limits the weed infestation and checks the evaporation. Hence, the mulching practice restores the soil with its physical, chemical and biological properties, as it adds the both micro and macro nutrients and enables the soil microbes to release the soil fixed nutrients into the root system. The multiple effects contribute towards the increase in the yield up to 50-60 percent under rain fed conditions. (Patil Shirish, et.al 2013)

### 2. MATERIAL AND METHODS

The practice of mulching was done by utilizing different types of mulching agents. The material used includes both organic and inorganic. The organics are usually locally available and are on-farm produced. Whereas the inorganic are synthesized ones and they need prior work before use them in the field.

1. *Organic mulches:* The organic mulches are organic based material which includes the bark, wood chips, dry leaves, weeds, different crop residues like Maize stalks, Jowar stalks, Ground Nut stovers, Cotton stovers, etc are

used as the mulching materials. These organic mulching materials are degradable ones and during degradation and mineralization they attract different types of insects and pests and need to replace frequently. Some of the organic mulches which are used are

a. *Grass clippings*: This one of the richly available organic mulch in Indian agriculture. The different types of grass clipping are widely available. But the application fresh grass clipping is restricted because the root clippings of the grass may start regrowth and cause competition to the main crop as a weed so always the dried grass always preferred to use as mulch.

b. *Straw*: Paddy, Wheat and Ragi straw usually used as mulch. Even though the straw has low nutritional status after the decomposition the soil becomes more fertile and it has long life span in the field than the other organics (dry leaves, weeds, grass etc)

c. *News paper*: The combined sheets of thickness 2-3 cm are ideal for mulching, however these sheet of news papers are pasted with the help of gravels or pebbles. However, the usage of news paper mulches is restricted in high windy areas.

d. *Dry leaves*: These are abundantly available organic mulching material with easy degradation and good for mulching. Collection and spreading is also quite easy in the field but due to light weight the scattering was restricted putting the wood barks, small twigs in the crop row on these dry leaves restricts the further movement.

e. *Wood Bark clippings*: The use of wood bark clippings as mulch was more advantageous because they contain more moisture and retains this moisture for longer periods and helps in the supply of moisture to the growing crop. But, the availability of wood bark clippings was rare and sometimes may cause phytotoxicity.

f. *Saw dust*: It was obtained as the finished product in the saw mills. But, due to high C: N ratio, the decomposition is very late. However it retains the, moisture for longer periods.

g. *Compost*: It is one of the panaceas for the soil fertility status improvement. The availability and application of compost in our Indian agriculture is age old practice. It improves the soil physical, chemical and biological properties and enhances the organic carbon content which in turn improves the water holding capacity of the soil.

#### *Advantages of organic mulches:*

1. These mulches restricts the rain water flow rate and hence restricts the soil and water runoff

2. The beating action of the rain drops results in different types of erosion like sheet erosion, rill erosion and ravine erosions, but the organic mulches will restricts the formation sheet erosion which is initiation of erosion.

3. The rate of evaporation from the soil surface was restricted due to the avoiding of direct entry of solar radiation.

4. The mulches maintains the optimum soil temperature

5. The organic mulches attract the most of the soil beneficial micro-flora which in turn act on the degradable wastes and aids in the release of plant nutrients.

6. The organic mulches will act as the food for soil microbes

7. The mulches add the organic matter to the soil and improves the soil organic carbon content in the soil

8. More the organic carbon in the soil, the more the fragile of the soil, It facilitates the better root penetration and root development and extraction of nutrients from deeper layer of the soil

9. Mulching improves the all physical, chemical and biological properties of the soil

#### *Disadvantages of the organic mulches:*

1. These organic mulches are easily biodegradable and they can serve for only short period

2. They keep the soil moist but the aeration to the root system is restricted

3. Many organic mulches cause the breeding spot for many insects and pests

#### *Inorganic mulches:*

a. *Crushed stones, Grave and pebbles*: The inorganic and material other than organic were usually used in the perennial forest tree crops. These are usually spread in 3-4 layers around the base of the tree so that the soil moisture content should remain for prolonged period of time. They also reflect the solar radiation and create the congenial environment for the growth of the tree.

*Plastic mulch*: The different kinds and colors of plastic sheets are used for mulching, both the transparent and black type of plastic sheets of varied gauge are being used for mulching. The use plastic in mulching for crop production is called plasticulture. The plasticulture is highly practicing in the dry areas and more especially in the vegetables crop production. In plastic mulching, there are mainly two types,

i. *Photo-degradable plastic mulches*: This type of plastic mulch film gets destroyed by sun light in the shorter period.

ii. *Bio-degradable plastic mulch*: This type of plastic mulch: These types of mulches are easily degradable in the soil over a period of time

iii. *Colour of the film*: The type colour of the plastic mulch have an impact on the soil environment. So, selection of the particular colour varies with the specific purpose. Based on the purpose the different colored plastic mulches including black, transparent, white, blue, red, yellow etc. are being used. Generally, the following types of plastic mulches are being used in horticultural crops

iv. *Black plastic film type mulch*: It helps in soil moisture maintenance; weed controls the weeds and checks the transpiration loss

v. *Reflective silver films*: These type of plastic mulches helps in the maintenance of root zone temperature at the optimum level

vi. *Transparent films*: These increases the soil temperature and usually used for soil solarization

*Advantages of inorganic mulches:* Moisture conservation for longer periods, durability is more than the organics and not easily degradable in nature.

*Citation of Other methods of mulching*

*Surface mulching:* The process of spreading the mulching material on the surface of the crop land is called surface method of mulching

*Vertical method of mulching:* This process includes the opening of vertical trenches at the required depth, usually at 30 and 15 cm depth at an interval of 30 cm

*Polythene mulching:* The process of spreading the plastic sheets on the surface of the soil and around the tree trunk's is called the polythene mulching

*Pebble mulching:* This type mulching is usually done in forest tree species and also in the parks. The pebbles are used to control and check the transfer of heat from the soil and suppression of weed growth.

*Dust mulching:* The intercultural operations carryout in the standing crop will facilitates the closure of the water capillaries so the excess water movement into the atmosphere was restricted.

*Live vegetative barriers:* The nitrogen fixing species like Subbabul, Gyriceidia, Caussurina, are being cultivated on the field and contour bunds will facilitates the effective mulching and also adds the organic matter to soil by shedding the leaves. It also fixes the atmospheric nitrogen annually @ of 30-50 kgs per ha.

### 3. RESULTS AND DISCUSSION

The study conducted by using the Straw mulch has resulted in the higher soil moisture to an extent of 50 percent more than the control (Rajaput et.al 1970) and also the other study conducted by using wheat crop residue at the rate of 6730 kgs/ha has significantly recorded the higher average soil moisture up to the depth of 1.5 meter (Black a.al.1973) The production Okra was significantly higher under the straw mulch followed by dust mulch over the control (Batra B.R.et.al). The better plant growth and higher potato tuber yields were recorded with the straw mulch over the control (Sood, B.R.-1996)

The application straw mulch at the rate of 6.0 tons per hector has significantly increased the yield levels of both Tomato and Okra to the extent of 100 and 200 percent over the control (Gupta, J.P.1987) The yield of potato was higher under the straw mulch (27.9%) and also starch content was higher in paddy straw mulch (18.18%) (Dixit, C.K., 1995), hence, many studies are proved that the mulching will have a significant effect on the conservation and improvement of the yield in crop production.

*The effect of plastic mulches on the yield of fruit crops*

Crop	Yield (T/ha)		Percent increase in yield
	Mulched	Unmatched	
Guava	18.36	23.12	25.93
Mango	4.96	7.16	45.23

Papaya	73.24	120.29	64.24
Ber	7.02	8.92	27.06
Pine apple	10.25	11.75	14.363
Banana	53.99	73.32	33.95
Lichi	11	125	12.61

(Source: NCPAH, New Delhi National Committee on Platiculture applications in Horticulture)

*The effect of plastic mulches on the yield of vegetable crops*

Crop	Yield (T/ha)		Percent increase in yield
	Mulched	Unmatched	
Broccoli	15.64	25.14	60.74
Cauliflower	18.58	25.02	34.66
Brinjal	36.73	47.06	28.12
Tomato	69.1	94.85	37.26
Okra	6.91	8.56	23.88
Bitter Guard	20.12	25.63	27.39
Chilli	16.79	19.71	17.39
Cabbage	14.3	19.9	39.16

(Source: NCPAH, New Delhi National Committee on Platiculture applications in Horticulture)

### 4. CONCLUSION

The trend in agricultural production is shifting from the conventional methods to innovative methods like sprinkler irrigation drip irrigation, fertilization etc. The ultimate view is the agricultural production with the efficient utilization of existing and available technologies. The use of organics and plastic as mulching materials is now becomes an inevitable in agricultural production. Due to the multiple beneficial effects by both all types mulches including organic, inorganic and plastic mulching. With the conservation of soil and water the increase in yield also achievable to the extent of more than 50 percent. Hence, there is wide scope for the practice and usage of mulching materials in crop production with the conservation of natural resources factors including soil and water.

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