



ORIGINAL RESEARCH PAPER

Agricultural Science

ORGANIC MULCHING - WATER USE EFFICIENT TECHNIQUE FOR TOMATO PRODUCTION

KEY WORDS:

Renu Yadav

Assistant Professor, Amity Institute of Organic Agriculture Amity University Uttar Pradesh, Noida

Shiv Bhushan Verma

Junior Research Fellow, Amity Institute of Organic Agriculture Amity University Uttar Pradesh, Noida

ABSTRACT

Tomato (*Lycopersicon esculentum* Mill.), a member of family Solanaceae, is the most popular and widely grown vegetable in the world. In spite of its wide cultivation, the average yield is rather low since little attention is paid towards scientific cultivation. Moisture stress, which affects the production adversely, is one of the major problems for its cultivation. From the findings of the several studies it shows that organic mulching can reduce evaporation rates, provides valuable nutrients as the mulch breaks down, encourages worms, which aerate the soil and provide fertilizer in the form of worm castings and reduces the amount of weeds by inhibiting the germination of weed seeds. In this paper, an attempt has been made to overview on the various types of organic mulching benefits and its limitations.

Introduction:

Tomato (*Lycopersicon esculentum* Mill.), a member of family Solanaceae, is the most popular and widely grown vegetable in the world. Most farmers in our country depend mainly on natural fertility of the soil and in addition, invest considerable labor in land preparation and weed control, so as to achieve a reasonable yield of tomato. In spite of its wide cultivation, the average yield is rather low since little attention is paid towards scientific cultivation. Moisture stress, which affects the production adversely, is one of the major problems for its cultivation. Much attention has not been paid on the use of soil cover. The growers often get low yield of poor quality fruits due to non-availability of irrigation water. The use of mulch has been found beneficial (Hooda et al., 1999). The natural mulching materials such as paddy straw or sugarcane tresses retarded the weed growth considerably as compared to control (Kwon et al., 1988). Mulching improved soil physical conditions by enhancing biological activity of soil fauna and thus increased soil fertility (Lal, 1989). Use of mulches offers great hope because of its moisture conserving and soil temperature regulating ability (Bhella, 1988; 1988; Chakraborty and Sadhu, 1994).

Organic Mulches

Organic mulch materials include grain straw, fresh or old hay, fresh-cut forage or cover crops, chipped brush, wood shavings, tree leaves, cotton gin waste, rice or buckwheat hulls, and other crop residues. Organic mulches that are found in nature and can be broken down by soil organisms due to decomposition whereas; inorganic mulches are man-made material or anything like a rock, polythene etc. that cannot be broken down by soil organisms. Organic mulches are more beneficial than inorganic mulches. Choice of organic or inorganic mulch mainly depend on the user but using an organic mulch means utilizing a material available in the field and it might be degraded and breaks down into organic matter.

Hay:

Hay is often used to mulch horticultural crops, it is easily available in the garden & after decomposing, it adds many more nutrients to the soil. A hay mulch of about 3-4 inch thickness reduce emergence of weed seedlings, especially small-seeded broadleaf annuals (Schonbeck, 2012). It provides habitat for beneficial organisms, including ground beetles and other weed seed consumers. Rain water and air can easily reach the soil.

Straw:

Straw, are the stalks and other residues left after harvest of a mature grain, is similar to hay in texture, potential for soil protection and moisture conservation, weed suppression, and application methods. Straw is an ideal for mulching because it can be easily applied in the field, stays in place and is lighter colored and more reflective & reflects sunlight which helps to bear fruit in some vegetables. The main advantageous property is that it does

not contain weed seeds itself. Glab and Kulig, 2008; Ossom and Metsenja (2007) reported that straw mulch unlike other mulches was able to increase the infiltration rate of rain or irrigation water.

It is beneficial for cool weather crops like potato, in which tuber growth is inhibited by soil temperatures and for other crops during hot summer weather. Tomato shows optimal nutrient uptake and production at root zone temperatures of 70-85°F, and becomes stressed at higher temperatures (Abdul-Baki and Teasdale, 1994; Tindall et al., 1990; Tindall et al., 1991); thus, it often performs better in organic than in plastic mulches during the heat of summer. Bright, reflective straw can intensify heating of crop foliage under a row cover, resulting in crop damage (Kittredge, 2008-09a), and may also increase damage from frosts. Rahman et al. (2006) reported that treatments with mulches, i.e., rice straw, water hyacinth and wastage of rice straw, significantly increased the tomato yield over control (no mulch).

Bark:

Bark contains more moisture and retains this moisture for longer periods and helps in the supply of moisture to the growing crop. This material is acidic in its reaction and it should be avoided to use in vegetable fields. Softwood barks are more resistant to decay than hardwood bark. It is available in a variety of sizes that fit many landscape needs. It forms a stable humus when fully decomposed. Provide calcium (Ca), micronutrients, and small amounts of N, P, and K to the soil.

Grass Clipping:

Grass clippings are a free, high-nitrogen fertilizer. They contain nitrogen, potassium and phosphorus, as well as lesser amounts of other essential plant nutrients. It is one of the most easily and abundantly available mulching material in agriculture farms. The different types of grass clipping are widely available such as green or fresh and dry grass. Normally, green grass clippings are not used in the rainy season because it may chance to the development of its own root systems which will be harmful to crop growth. Grass clippings mat are used to protect plants and retain heat. Plant-based mulches, i.e., woodchip (Teak) and grass (Pennisetum) are effective in controlling weeds in tomato (Awodoyin et al., 2007). Uwah and Iwo (2011) stated that there was a decrease in weed biomass in maize when there was an increase in grass dose applied as mulch.

Dry Leaves:

Leaves are beneficial for soil it contributes nutrients when used as mulch. Dry leaves are the easily and abundantly available and it make a better mulch if it composted. The thickness of mulch applied depends on the heat, if weather is too hot, thicker mulch should be applied. Leaf mulch help in retaining soil moisture and also suppress weeds. Parmar et al. (2013) found that soil mulching with wheat straw and dry leaves mulch contributed to

increase watermelon yield as compared to the control plot without mulch.

Compost/Manure

The compost is good mulch and can be easily prepared by composting of different types of waste materials like leaves, straw, grass and plant residues. It improves the soil properties and enhances the carbon content which improves the water retention capacity of the soil. Because it retains moisture, mulch is an environmentally friendly option everywhere but is particularly useful in areas where drought or water restrictions are a concern. Mulching increased the soil porosity and reduced soil compaction (Khurshid et al., 2006). It should not be used in the vegetable field because they have too much nitrogen and it may contain weed seeds (Ranjan et al 2017). Manure is not recommended as a mulch for weed control. Many weed seeds pass through livestock digestive tracts unharmed, and the readily available nutrients in the manure stimulate weed growth. *Chenopodium album* and *Amaranthus spinosus* are two of many nutrient-responsive weeds that are frequently spread in manure (Schonbeck, 2012).

Newspaper

Newspaper mulching helps to control weeds and is readily available. The newspaper layer biodegrades into the soil in a small time. The newspaper is better than plastic because it will eventually decompose. Laying several layers around and between tomato plants prevent new weeds from germinating. Glossy paper in vegetable fields should be avoided because the ink could leach into the soil. Paper, biodegradable plastic and rice straw are potential substitutes for polyethylene and herbicides (Anzalone et al., 2010).

Limitation of Organic Mulching

Many of organic mulches cause the breeding spots for many insects and pests. Mulches such as hay and straw contain seeds which may become weeds. Before applying of organic mulch, remove weeds from the field. Selected mulching material should be free of any weed seeds. Generally, avoid the mulch material which is contaminated with pesticides or disease..

Conclusion

Mulching with organic materials increases the soil nutrients, maintains the optimum soil temperature, restrict the rate evaporation from the soil surface, restrict weed growth and prevent soil erosion These are the cheap materials & are easily available in farm so the cost of mulching is economical. Organic mulches are environment-friendly and maintain the soil moisture, and increase water use efficiency.

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