



Impact of Mulches on Landscape Plants

Excerpted from:

Chalker-Scott, L. 2007. Impact of Mulches on Landscape Plants and the Environment - A Review. J. Environ. Hort. 25(4): 239-249.

Comparative Benefits of Mulches

Improved soil moisture.

Bare soil exposed to heat, wind, and compaction loses water through evaporation and is less able to absorb irrigation or rainfall. Using mulches, the soil has greater water retention, reduced evaporation, and reduced weeds. One study documented a 35% reduction in evaporation when a straw mulch was applied.

There is a wide variety of permeable mulching materials. Organic mulches conserve water more effectively and do not limit soil water infiltration and retention. An appropriate mulch can reduce the need for irrigation and in some landscapes can eliminate irrigation all together. Coarse organic mulches protect soil water reserves holding water for later release and prevent runoff. Mulch can also protect trees and shrubs from drought stress and cold injury.

Reduced soil erosion and compaction.

Mulches protect soils from wind water, traffic induced erosion and compaction that directly contribute to root stress and poor plant health. Even adding a thin organic mulch will protect soils. For instance using a straw mulch, fallen pine needles or wood chips can reduce erosion and overland flow. Using bark or jute on compacted urban soils restores soil aggregation and porosity. It is better to apply mulch before compaction occurs as it is difficult to reverse. Proactive mulching will protect soil integrity.

Maintenance of optimal soil temperatures.

Mulches have shown to lower soil temperatures in summer months. Extreme temperatures can kill fine plant roots which can cause stress and root rot. Mulches protect soils from extreme temperatures, either cold or hot. Coarse mulches are more temperature moderating and allow for better water and gas transfer than thick layers of finely textured mulches.

There is an effect of mulch type on surface temperature. Some mulches heat the soil as a function of solar radiation absorption more than bare soils. Increased surface temperature due to pine bark mulch has been shown to cause nearby leaves to lose more water.

Increased soil nutrition.

Organic mulches can increase, decrease or have no effect upon nutrient levels depending on mulch type, soil chemistry, and particular nutrients of interest. Mulches with relatively high nitrogen content often result in higher yields, but low nitrogen mulches, such as straw, sawdust and bark, can also increase soil fertility and plant nutrition.



Reduction of salt and pesticide contamination.

In arid landscapes, evaporating water leaves behind salt crusts. Because mulches reduce evaporation, water is left in the soil and salts are diluted. Organic mulches can actively accelerate soil desalinization and help degrade pesticides and other contaminants. Plastic mulches can not bind ions as organic mulches can and are not effective in this regard.

Increased binding of heavy metals.

Organic mulches can be effective in removing heavy metals from landscape and garden soils.

Improved plant establishment and growth.

Mulches are used to enhance the establishment of many woody and herbaceous species. Mulches improve seed germination and seed survival, enhance root establishment, transplant survival, and increase plant performance. Overall, mulches grow healthier landscape plants requiring less maintenance.

The improved water retention created by a mulch allows roots to extend and establish farther beyond the trunk compared to bare soil. Plants thus become more stabilized. Root development is greatest under organic mulches compared to plastic or bare soil. Sheet and film mulches encourage root growth on top of the mulch, injuring plants when removed. Plastic mulches can lead to increased mortality of transplanted material and cause extensive damage to fine root systems. Roots tend to grow into organic mulch layers, and it does not appear to injure the plant to have roots exploring a mulch layer.

Reduction of disease.

Mulches will reduce the splashing of rain or irrigation water, which can carry spores of disease organisms to stems and leaves of plants. Populations of beneficial microbes that reduce soil pathogens can be increased with mulches. Mulches can combat disease organisms directly as well.

Some plastic mulches can increase the incidence of disease by exacerbating already poor soil conditions, causing various types of rots.

Reduction of Weeds.

Using mulches for weed control is highly effective. Mulches can reduce seed germination of many weed species and reduce light, which stresses existing weeds. Coarse materials are more effective than fine textured ones in reducing weeds.

Reduced pesticide use.

Mulches reduce weeds, plant stress, and susceptibility to pests and pathogens which translates to reduced use of herbicides, insecticides, and fungicides.

Mulch Problems-Real and Perceived

Acidification.

There is no scientific research to support that organic mulches such as wood chips and bark have any effect on soil pH. In nursery production woody materials used as potting medium have an acidifying effect as they release phenolic acids as they decompose. Soil acidification due to mulching with woody material is unlikely to occur as it is not worked into the soil.

Allelopathy.

Properly applied landscape mulch will not have allelopathic effects on established landscape plants. It is most likely to injure newly planted or shallow rooted plants. A short period of composting and correct application of woody mulch will prevent damage.

Disease.

Many mulches made from diseased plant materials can be composted or treated at temperatures that kill pathogens that can be transmitted to healthy plants.

Flammability.

In general, wood based mulches are not flammable even though there are documented incidences of spontaneous combustion of yard wastes.

Nitrogen deficiency.

It is a common misconception that woody mulches create a nitrogen deficiency upon plant materials. Many studies have demonstrated that woody mulch materials actually increase nutrient levels in soils and or/associated plant foliage. Neither nitrogen immobilization nor growth suppression occurs as a result of using woody materials for mulch.

Pests.

Many organic mulches, especially wood-based mulches, have the reputation as being “pest magnets”. On the contrary, many are not attractive to pest insects but are actually insect repellent.

Weed contamination.

Improperly treated crop residues and composts as well as bark mulches are often carriers of weed seed. Mulch must be deep enough to suppress weeds and promote healthy soils and plants. Weed control and enhanced plant performance are directly linked to mulch depth.

9/08