



RUBBER MULCH -Beware

Rubber mulch is typically made from ground up recycled tires and has generated a lot of discussion on the benefits and risks or dangers of using it.

There seems to be two schools of thought on rubber mulch. It seems that all the studies paid for by the rubber mulch manufacturers and tire companies show benefits after their PR firms get through with them, while all the independent studies show that it is toxic and dangerous.

So what do we really know about rubber tire mulch?

Advertised or alleged benefits of Rubber Mulch:

- doesn't float away
- doesn't blow away
- doesn't decay away
- doesn't sink into the ground
- doesn't feed house insects
- doesn't smell, mat or mold
- impedes weed growth
- water and nutrients permeate
- safe for flowers, plants and pets
- improves landscaping
- many designer colors available
- saves time, money and your back
- lasts many years
- good for playgrounds (twice the cushioning effect of sand or gravel)
- doesn't burn plants or children
- cost effective
- safe for children

Let's look at each of these claims and see what the research says:

Doesn't float away, Doesn't blow away, Doesn't sink into the ground

Most rubber mulches have a specific gravity greater than water hence they do not float or wash off as easily as some other materials like bark mulches. If the soil is healthy and full of microbes and earthworms ALL materials will settle and sink over time (remember Charles Darwin's work on earthworms). If a material is heavier (denser) than water, it will sink or settle faster than a lighter material like an organic mulch.

Research at Texas A&M University found that the particles from shredded brush (i.e. native mulch) would physically lock together preventing erosion even in extreme weather events. Researchers have also found that during decomposition that bacteria produce chemicals called polysaccharides that act as glue to help hold the particles together. The hyphae from many fungus species also help to lock the particles together and to the soil surface. As a result, the native mulch and compost resisted erosion (floating or blowing off) better than any other material tested.

Doesn't decay away, Lasts many years

Rubber mulch is broken down by microbes like any other product (remember microbes can break down granite rocks into soil), rubber is easy by comparison. The rubber encourages species of bacteria that break down rubber and rubber like products in your home to multiply. The additives in tires to prevent bacteria decay (which are toxic chemicals) are broken down by white and brown rot fungal species that live in soil. This same decomposition is what releases the toxic chemicals in tires.

Doesn't feed house insects

This is a true statement, I do not know of anything that eats tires except microbes. However, the tire mulch does kill many species of good microbes that kill insects and prevent disease. The toxic chemicals in the tires will also kill beneficial insects that help control pests.

Doesn't smell, mat or mold

This may be a matter of opinion, but most people find that rubber mulch starts to stink as it gets hotter. On a hot day it has a strong stench. As tires are ground up into chips the

amount of surface area is greatly increased and all the new surfaces are freshly exposed allowing for maximum odors to be released. Many people get sick from just being in the sales area of a store selling new tires.

As rubber mulch heats up, it releases toxic gases such as volatile organic compounds (VOCs) and another class of chemicals called polyaromatic hydrocarbons (PAHs). These gases have been found to cause irritation of the nasal and respiratory passages, central nervous system damage, depression, headaches, nausea, dizziness, eye and kidney damage, and dermatitis. Hence, ground tires should never be used in an enclosed area or indoors. These effects would be even worse in areas of high air pollution (i.e. Houston).

It is true that rubber mulch will not mat down as easily as organic mulches, since the beneficial microbes that create soil structure, prevent insect and disease problems, cannot live in it.

As to mold, I have seen many tires used on piers and boat docks covered with algae. I have also seen tires used as planters covered with what appears to be mildew and mold. Mildew and mold will grow on about any surface if moisture is present, *unless* it is too toxic and something kills them.

Impedes weed growth

In comparison studies of several mulch types in herbaceous perennials, rubber tire mulch was less effective than even raw wood chips. Other studies have found that even sawdust worked better and have found rubber mulch less effective than straw and other fibers.

Several studies have found that rubber tire mulches kill many species of plants hence the public relation specialist spin it off as “retards or impedes weed growth”. Who wanted flowers in the first place?

Also as temperatures rises the type of plants that will survive is reduced and rubber mulch can get fairly hot (see below). Metal toxicity also reduces the type of plants that can live and grow in rubber mulch (see below).

Water and nutrients permeate

Some researchers have found that ground up tires can absorb chemicals from fertilizers and pesticides preventing them from leaching into ground water. Hence, fewer nutrients reach the plants. Eventually, the tire chips will degrade and the stored chemicals will be released most likely at time when one does not want or need them.

Water will run through the tire mulch as it is highly permeable. However, the problem begins when the water reaches the surface of the soil. Earthworms and soil microbes create soil structure allowing air and water to enter the soil. Earthworms and microbes require decomposing organic matter as a food and energy source. Without this food source most of the earthworms and microbes will die off and the soil structure will collapse over time. When this happens, the soils will become anaerobic (favors root pathogens) and water and air cannot enter easily. Hence, conditions may be created that favor disease and since the water can no longer be absorbed, it must run off.

Safe for flowers, plants and pets

Research at Bucknell University has found that the leachate from ground tires can kill entire aquatic communities of algae, zooplankton, snails and fish. Even at low concentrations it can cause reproductive problems and precancerous lesions. Also, marine life from seaweeds to plankton is negatively affected.

The toxic nature of the leachate from tire rubber is due at least in part to the chemicals used in producing tires (cadmium, chromium, aluminum, copper, iron, manganese, molybdenum, selenium, sulfur, and zinc). Of these minerals, rubber tires may contain extremely high levels of zinc even up to 2% of the tire mass. Many plant species have been shown to accumulate zinc in their tissues to the point of death. USDA researchers who have studied the effects of metals in sewage sludge, biosolids and compost, have found that ground rubber should not be used on any agricultural or garden soil, potting media, or compost. Yes- some companies use tire chips and crumb rubber as a bulking agent for compost and we wonder why the compost does not work and is toxic to plants!

Other rubber leachates have been found to cause problems from skin and eye irritation to

major organ damage and even death. Long term exposure can lead to carcinogenesis and mutagenesis. For example, 2-mercaptobenzothiazole used in vulcanizing rubber is highly persistent in the environment and harmful to aquatic life. Ground rubber also contains a class of chemicals called Polyaromatic hydrocarbons (PAHs) that many studies have found extremely toxic to humans and the environment.

Research has also found that the toxicity of leachate from the rubber tire mulch increases over time as the rubber breaks down.

Improves landscaping

I am not sure what is meant by this claim. Consumer Reports Magazine found that some of the rubber mulches tested faded during the tests. Personally, I do not like the bleached out look.

The USDA Agricultural Research Service, after over 20 years of research concludes that on the zinc factor alone, ground or chipped tire material should never be used in gardens or landscaping.

How can a material that kills many types of plants be classified as “Improves Landscaping” unless one likes a barren and sterile yard.

Many designer colors available

This is a true statement. Rubber can be painted to almost any color. On whole tires paints tend to peel or rub off over time. I wonder what is in the paints or dyes used on tire chips and how long they will last. One study found that tire chips started fading fairly quickly.

Saves time, money and your back

Let's look at saving money. Consumer Reports found that prices ranged from \$13.75-\$15.00 per cubic foot for various brands of rubber mulch (the average wood mulch was only

\$1.50 per cubic foot). This works out to over \$400 per cubic yard! A person can buy a extremely high quality *composted and screened* “Native Mulch” or “Compost” for less than \$35 per cubic yard in bulk.

Native mulch or compost improves soil quality reducing a plant’s water requirement by 50% or more which saves money. They also provide nutrients and help a plant become healthier (less disease and insect problems) again saving money. The plants grow much faster so a smaller plant (lower cost) may be purchased again saving money.

I wonder what happens as leaves and grass are blown onto the rubber mulch. In organic mulches, one would just rake it up and if a few pieces of wood chips get mixed in, who cares as it all goes into the compost bin. But with rubber mulch how does one get the tire chips out and at \$400/cy it is very expensive to waste.

Since chipped tires are heavier than water and organic mulches, it means it takes more work to move and spread them. Coupled with the extra cleaning required to keep them looking nice, I wonder how this saves your back. Also since it is not available in bulk, one must load it into your car, unload it when you get home, and then tear open the bags and spread it (less work?).

A few other studies have looked at soil temperature under rubber mulch as compared to other types of mulch or bare ground. *If* the rubber mulch is several inches thick, then soil temperatures are not excessive, however, the instructions on some bags say to apply only one inch thick. If used at the required thickness (3”) to keep the soil cool, then the cost would triple and there would be far more toxic material on your property.

Good for playgrounds (twice the cushioning effect of sand or gravel)

Consumer Reports found that the rubber pieces contained small pieces of steel and nylon and recommended it not be used for playgrounds.

One study comparing rubber mulch to organic materials like wood chips, used double ground bark and uniform wood chips as their reference. For a mulch to be effective for playgrounds, it needs to be loose without any fines to prevent compaction and keep it

springy for shock absorption. Double grinding a bark mulch creates a lot of “fines” that will help the mulch pack hard and tight as it fills in all the open areas. Barks also tend to be hard and brittle, not flexible like ground branches and limbs which are often used for playground mulch and do not contain any toxic chemicals. Similarly, uniform wood chips from a chipper, since they are thin and flat (versus long and stringy from a grinder), would also pack down hard and tight (of course uniform wood chips are not a good choice for playground mulches). Other comparisons included sand and gravel which are illegal in many states for use as playground mulch.

Since rubber mulch does not mat down or lock together, it will easily escape the playground area and migrate into the surrounding lawns or flowerbeds. I remember when I was a boy, I used to enjoy throwing the rocks used in playgrounds and they usually did not land in the playground area. I wonder how the chipped tires would look scattered across a lawn or driveway next to a playground.

Doesn't burn plants or children OR Safe for children

One study found that the surface of temperature of rubber tire mulch exceed that of a black asphalt parking lot even reaching as high as 172 °F on one day (the last time I checked water boiled at 212 °F). At the very least I think this would be extremely uncomfortable producing scalding and other burns if a child fell onto the hot rubber mulch. The reflected heat from rubber mulch would also increase the chance of heatstroke similar to an asphalt parking lot and not a safe or fun place to play.

One rubber mulch web site even stated that rubber mulch from tire was not flammable. I have seen many auto fires in my life and the tires do burn. Land clearers used to use old tires at the bottom of the brush piles since they would burn extremely hot for a very long time to help get rid of green wet brush that was difficult to burn. Research at The Ohio State University Agricultural Technical Institute discovered rubber mulches to be a considerable fire hazard. Some mulch like cocoa hulls were difficult to light while other material like ground rubber had flames within a minute and were very difficult to extinguish. They found that organic mulch fires were not common. They were hard to start, and if they did start, they spread slowly. Composted native mulches and compost have very low carbon to nitrogen ratios. For a fire to burn hot and spread, it must have a very high carbon ratio (i.e.



raw wood, lumber, rubber, etc.) since carbon combining with oxygen is the energy source.

Rubber tire chips have also been used around the country as back fill in highway construction projects. There have been repeated cases of spontaneous combustion reported even in cool climates like Oregon and Washington State (Biocycle Magazine).

I wonder what would happen if a flaming bottle rocket landed on some rubber mulch or a spark from the bar-b-que pit or fireplace. I also suspect some insurance companies may not take kindly to the use of flammable materials around the house. For example many companies will not write homeowner insurance policies or require much higher premiums, if flammable materials like wood shingles are used since it is a fire hazard.

Cost effective

From the information above, there is not a chance of being anywhere near “cost effective.” The only cost effectiveness I can think of is for the seller of rubber mulches. Tire chips have been successfully used for fuel to power electric generators and as an ingredient to make asphalt for road construction. Why sell tire chips to these markets at \$10 per cubic yard or less if you can get someone to buy it at \$400 per cubic yard as mulch.

I recently saw an advertisement for a chipped rubber mulch that was glued into sheets ½” thick and six inches wide. It was designed to be a landscape edging between the flowerbed and grass areas that could be driven on by a lawnmower tire. It might also be a surface that one could kneel on to pull weeds from the flowerbed. In some climates and areas without runner grasses it might have some benefit.

Overall rubber mulch should be avoided.

References:

“The Myth of Rubberized Mulch”, Balls & Burlaps - Washington State Nursery and Landscape Association, Linda Chalker-Scott, PhD, Puyallup Research and Extension Center, Washington State University



“The Myth of Rubberized Landscapes: `Recycled rubber mulch is an environmentally friendly, non-toxic choice for landscapes’,” Horticultural Myths, September 2005, Puyallup Research and Extension Center, Washington State University

“Is your Landscape Going Up In Smoke”, Larry Stewart, Ornamental Plants Annual Reports & Research Reviews, 2002

“Gardeners, Tread Lightly”, Lindsey Hodel, Mother Erath News Green Gazette, April/May 2003

“Wood Mulch, Rubber Mulch and Other Bad Ideas”, Mike McGrath, Horticulturalist Gardens Alive

“Foliar Accumulation of Zinc in Tree Species Grown in Pine Bark media Amended with Crumb rubber”, Edward Bush, K. Leander & A. Owings, The Journal of Plant Nutrition 24, 2001.

“Zinc Phytotoxicity”, published in Zinc in Soils & Plants, 1993, Rufus Chaney, PhD, USDA

“Re: Tires”, commentary, Sustainable Agriculture Research & Education, 1997, Rufus Chaney, PhD, USDA

“Alternatives to Wood Mulch”, Consumer Reports, May 2006

“Benefits of Rubber Mulch”, Rubber Safe Playgrounds, Inc., from Internet web site.

“The Use of Compost and Shredded Brush on Rights-Of-way for Erosion Control: Final Report”, Texas Transportation Institute, 1997, Texas A&M University, Research Report 1352-2F

“Effects of Ground Rubber on Phaseolus vulgaris”, M. Schultz, Z. Pflanznahr Bodenk, 1987

Soil Microbiology: An Exploratory Approach, Mark Coyne, 1999, Delmar Publishers, ISBN 0-8273-8434-3



“A comparison of Various Mulches; temperature relationships and plant growth”, Curtis E. Swift, PhD, Colorado State University Cooperative Extension

“Golfing Towards a Greener Environment”, Emily Carlson, University of Wisconsin-Madison, November 10, 2003

“Growth of Chrysanthemum with ground automobile tires used as a container soil amendment”, Bowman, D.C., R. Y. Evans, & L. L. Dodge, Horticultural Science 29, 1994

“The Physiology of Metal Toxicity in Plants”, C. D. Foy, R. L. Chaney, & M. C. White, Annual Review of Plant Physiology 29, 1978

“Now You Too Can Kill Your Garden with Rubber Mulch”, Paghat’s Garden

“Zinc Toxicity from Tire Rubber in Soilless Potting Media”, A. Handreck, Community Soil and Science Plant Anals 27, 1996.

“Ground Rubber: Potential to Plants”, M. R. Tucker, North Carolina Agriculture & Consumer Services Agronomic Division Nursery Notes, April 1997

“Experts Wary of Rubber Mulch”, Marty Wingate, Seattle Times, Saturday April 29, 2006

“Rubber Mulch May Have Downside”, Sandy Feather, Post-Gazette, May 6, 2006