

RUBBER MULCH USE IN HOME GARDENS AND LANDSCAPES



Introduction

Vulcanized rubber is a durable material used in many consumer products including car and truck tires. While durability is important for tires on a vehicle, it becomes a problem once those tires are discarded. Worldwide, over one billion tires are scrapped annually (LeBlanc 2018). Discarded tires are often called the bane of waste management because of the difficulty in disposing of them. Scrap tire stockpiles can create significant fire hazards, such as the infamous 1983 tire fire in Virginia that burned for nine months. Tires dumped illegally are environmentally dangerous enough to be defined as pollutants.

To address this solid-waste problem, researchers have been studying ways to reuse discarded tires. Generating energy and rubberizing asphalt are two successful strategies for using this discarded material. Old tires can also be ground up as a mulch for use on playgrounds and landscapes (Figure 1). However, this practice places recycled rubber products into greater contact with people, pets, and the environment.

This publication summarizes the current scientific research on the use of recycled rubber mulches in home landscapes with a focus on human and environmental safety.



Figure 1. Dyed rubber landscape mulch. Photo: L. Chalker-Scott.

Efficacy of Recycled Rubber as a Landscape Mulch

There are few documented benefits to using rubber mulches in gardens and landscapes, though packaging can suggest otherwise (Figure 2). Studies have found mulches and mats made from tires to be less effective in tree establishment or in controlling weeds than mulches and mats made from organic materials such as wood chips or natural fibers (Arthur and Wang 1999; Calkins et al. 1996; Stokes 2012). Researchers have observed leaf yellowing, reduced tree growth, and increased tree mortality when rubber mulch is used (Stokes 2012). Soil tests revealed high levels of zinc, which is incorporated during tire manufacturing. Zinc can be accumulated to toxic levels by plants and can result in the symptoms previously noted (Bush et al. 2001, 2003). In fact, Brown (2007) states “The excess amount of zinc in the rubber tire mulch makes it unacceptable to be used in gardens.”

Rubber mulches have other undesirable characteristics as well. Compared to a dozen organic mulches, rubber mulch was the most likely to ignite and most difficult to extinguish (Steward et al. 2003). As forest fires increase in their severity and frequency, threatening homes in the wildland-urban interface, the use of any flammable mulch should be avoided. Rubber mulches can also lead to pest problems. A recent study reported that female Asian cockroaches preferred rubber mulches for shelter, as did their offspring. In contrast, wood chips were least preferred by roaches (Snoddy and Appel 2013).



Decomposition and Toxicity of Rubber Mulch

Ground rubber is advertised as permanent mulch (a Google search for “permanent rubber mulch” illustrates this claim), but permanent is a relative term here. Tires contain rubber and other naturally occurring chemicals, which are broken down by microbes over time. Many bacterial species can use rubber as their sole energy source (Basik et al. 2021). Naturally occurring white-rot and brown-rot fungal species also break down the chemicals found in tires (Bredberg et al. 2002).

Decomposition of rubber means that breakdown products, including heavy metals and other chemicals of concern, leach into the surrounding soil and water. Rubber leachates also contain various plasticizers and accelerators used during the vulcanizing process, a process in which rubber is chemically treated to give it useful properties such as strength or elasticity.

Leaching increases as the particle size of recycled tires decreases. In other words, the smaller the particle size, the greater the potential for leaching: intact tires will leach less than shredded tires. Toxins associated with crumb rubber (Figure 3), a more finely ground type of rubber mulch used on synthetic-turf fields, are well documented (Gomes et al. 2021). Benzothiazole, a toxic, airborne contaminant from crumb rubber, is the primary rubber-related chemical found in synthetic turf studies. Polycyclic aromatic hydrocarbons (PAH) such as naphthalene, phthalates, butylated hydroxytoluene, and other chemicals of concern have been found in the air, water, and soil adjacent to crumb rubber and other recycled tire products.



Figure 2. Advertised benefits of rubber mulch. Photo: L. Chalker-Scott.

Human and Environmental Safety Concerns

Substantial research provides evidence regarding the significant human health risks associated with exposure to crumb rubber and its decomposition products in turf fields and playgrounds worldwide (Gomes et al. 2021). An earlier literature review of the exposure risks concluded “...it is prudent to assume that any chemicals in the tires or released by them can be transferred to exposed individuals” (Brown 2007).

While research has primarily focused on crumb rubber rather than rubber mulch, these research results can be extrapolated to mulches, given that recycled tires are the source of both products. Landscape professionals and homeowners would have physical contact and potential inhalation of dust or vapors while working around rubber mulch (Brown 2007). Benoit and Demars (2018) found that rubber mulches “contain and can release a wide variety of substances known to be toxic,” leading them to “argue against their use where human exposure is likely.”

As mentioned earlier, plant health and survival are negatively affected by rubber mulch; earthworm survival significantly decreases when exposed to soil containing rubber compared to clean soil (Pochron et al. 2018). Decades of research have confirmed that entire aquatic communities of algae, zooplankton, snails, and fish can be injured or killed when exposed to rubber leachates (Wagner et al. 2018). The body of evidence is growing, documenting that recycled rubber products release harmful compounds and that these compounds pose threats to human health and environmental safety.



Figure 3. Crumb rubber is a more finely ground version of rubber mulch. Photo: L. Chalker-Scott.

Overall Recommendation

Scientific research provides ample evidence that rubber mulches should not be used in gardens and landscapes:

- They are not permanent mulch materials.
- They do not provide substantial benefits to gardens or landscapes.
- They are highly flammable and can be difficult to extinguish.
- They can attract insect pests.
- They contain toxic levels of zinc which injures or kills plants.
- Over time rubber mulches release hazardous chemicals that pose a health and safety risk to humans and the environment.

Other mulch choices, especially arborist wood chips (Chalker-Scott 2015), are better performers and pose none of the environmental risks attributed to rubber mulch.

Further Reading

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