



By ROBERT TURNER

How Safe is Cardboard Mulch?

Given the rising concern about PFAS (per- and poly-fluorinated substances), is it wise to use cardboard boxes as ground cover or mulch in your garden? Recent research

shows that vegetable plants can absorb harmful PFAS molecules from the soil. And while PFAS chemicals are not normally added to standard cardboard shipping boxes, they may get in from the recycling process.

Since the COVID pandemic, that brown, unassuming, Amazon cardboard box has become an even more prevalent household item destined for the recycle bin or the garden bed. Millions of backyard gardeners use cardboard boxes to control weeds and prep the soil in their garden beds. Some gardeners till the cardboard into the soil in the spring as a source of carbon. Cardboard is a carbon-intensive, wood-based product which can be good for the soil. Adding leaves or wood mulch on top of the cardboard, keeping it moist through winter, helps to break it down. Cardboard ground cover is a sustainable way to give that old box a new purpose in life, but what else are we adding to our soils with this long-standing practice?



Cardboard mulch. Photo by Robert Turner

The half-life of many of these chemicals is estimated to be more than 1,000 years.

PFAS have been used in paper and cardboard food packaging since the 1950s, primarily as a coating to prevent fats, grease and water from food soaking into and softening or reducing packaging strength. Paper wrappers, microwave popcorn bags, and boxes and cups at fast-food chains are just some of the examples. PFAS chemicals are very common in molded fiber bowls often marketed as “green” and “compostable.” Most fast-food companies are feeling the pressure to reduce and eliminate PFAS chemicals in their packaging.

But PFAS are everywhere now, often used in everything from clothing, to the Teflon coating on your pots and pans, to paper plates. It might be interesting to note that PFAS are found in most paper straws, meaning that as we tried to fix one problem (plastic straws in the oceans), we created another.

PFAS are found in the soil, rain and snow, groundwater, tap water, rivers and streams, lakes and oceans, the upper atmosphere, human and animal bodies, food and all over our homes. PFAS are now widely reported in drinking water, wildlife (including polar bears) and, more recently, human blood. One study determined that PFAS are present in more than 99 percent of the American population.

Studies have also shown links between PFAS exposure and a wide range of human health concerns from growth, learning and behavioral problems, to cancer, immune system disorders, fertility problems and obesity. PFAS chemicals have been linked to high cholesterol, ulcerative colitis, thyroid disease, testicular cancer, kidney cancer and

pregnancy-induced hypertension.

Research also shows that a large variety of plant species, including vegetables and grains, can absorb PFAS from the soil and the environment. These forever chemicals can get into our bodies when we ingest vegetable plants, so we must be conscious of what we’re putting into or on top of the soil.

WHAT'S IN THE BOX?

In 2019, it was estimated that Amazon shipped about 2.5 billion packages around the world every year. After the 2020 COVID pandemic, estimates are that Amazon increased its global shipping by at least 30 percent.

According to Amazon representatives, toxic chemicals are not used on company packaging and the company does not have a policy of spraying their packaging boxes. The standard cardboard box is made up from three components—wood pulp, glue and ink for printing.

Cardboard is manufactured using the long fibers from soft woods for the outer layers (ply’s) of the board, and shorter hard wood fibers for the middle, corrugated section. The glue that is used to hold these fibers together is generally a corn-based starch adhesive, so it’s a natural, vegetable-based glue and it’s safe for your garden because it will naturally break down. Glues can also be made from rice, wheat and potatoes. The standard black ink used on most Amazon boxes (and others) is also vegetable-based and harmless for garden application.

Use only brown cardboard in your garden (the natural color that comes from the wood pulp), and never use white boxes (they are bleached and may contain dioxin) or brightly printed boxes (inks can contain many chemicals). You should remove any tape, staples or labels that can have a weatherproof coating on them.

Because recent studies have shown a prevalence

of PFAS used in fast-food packaging, and many of those items are recycled, it is possible that those chemicals will mix and spread in the recycling process. But even if PFAS chemicals from food packaging make their way into recycled shipping boxes, the concentration of PFAS molecules will be greatly reduced because they are spread out over millions of feet of cardboard, minimizing the risk of plant uptake later on in your garden. PFAS molecules are so prevalent in the environment now that it is impossible to get away from them completely. Using cardboard mulch does not appear to add significant additional risk of exposure, and the benefits of reusing a box for sustainable purposes would likely outweigh the potential risks.



(Above) PFAS beading or soaking in. Photo courtesy of PFASfree.org. (Left) Amazon box “bead” test. Photo by Robert Turner

TEST YOUR CARDBOARD

One way to check for PFAS in cardboard is to conduct a simple “bead test” with olive oil. A key property of PFAS is the ability to change the surface tension or repel liquids, which leads to beading and run-off for liquids like oils, fats and water. Simply drop a small amount

of olive oil onto the cardboard using an eye dropper (or a pencil) and watch the results after a minute or so. Does the droplet soak in, spread out or form a perfect little bead?

If the olive oil soaks in or spreads out, your cardboard is probably free of PFAS chemicals. A perfect little round bead, like a half dome, could indicate the presence of PFAS. Please note this test is for identifying the possible or likely occurrence of PFAS, and is by no means a definitive result and should not be considered as such.

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