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The Myth of Polyacrylamide Hydrogels:

"Polyacrylamide hydrogels are environmentally safe substances that reduce irrigation needs"

The Myth

With a significant drought looming on the horizon for the Pacific Northwest, those of us whose business or pleasure includes landscape plants are understandably concerned with water issues. In response, the dot-com websites are full of products promising to reduce water usage in the landscape. Prominent among these products are hydrogels, which have been used successfully by the landscape industry to reduce transplant shock and increase containerized plant growth. These hydrogels, sometimes referred to as root watering crystals or water retention granules, swell like sponges to several times their original size when hydrated. Water is then released slowly to the surrounding soil, reducing the need for irrigation.

Once considered to be a professional nursery product, hydrogels are increasingly popular with homeowners who add them to vegetable gardens, container plants, annual beds, lawns, and perennial landscapes. The most commonly available are polymers of acrylamide and potassium acrylate. These polymers have a longer functional life, perhaps up to five years, compared to other organic hydrogels composed of starch, gelatin or agar. These latter hydrogels are commonly used in cosmetic surgery; polyacrylamide gels are not used for this purpose.

The Reality

My initial concern with hydrogel usage is the public perception that it is a permanent fix. Hydrogels are routinely touted as pH-neutral, non-toxic, environmentally friendly compounds, which they are in their polymerized form. The fact remains that after five years virtually all hydrogel will be depolymerized through natural decomposition processes. The rate of degradation is increased especially in the presence of fertilizer salts (and no, it doesn't make any difference if these are synthetic or organic fertilizers). One is then left with the original soil conditions; in a permanent landscape, this can be problematic unless other water-conserving steps are then implemented.

My second, and probably greatest, concern occurred when I discovered that hydrogels are constructed of acrylamide units. When hydrogels break down, they release potassium acrylate and acrylamide. Acrylamide is a lethal neurotoxin and has been found to cause cancer in laboratory animals. It readily passes through the skin and can be inhaled as dust. Unfortunately, the chemical data sheets on hydrogels do not mention the fact that within a few years they will be composed entirely of these acrylamide units. Since polyacrylamide is defined as "not readily biodegradable" (less than 10% is degraded after 28 days), some sellers of hydrogels actually promote their products as "nonbiodegradable!"

Who is at risk to acrylamide exposure? Workers in the nursery and landscape industry who routinely use hydrogels may become exposed to them as they degrade and become toxic. Homeowners who add hydrogel-containing potting mix to their landscapes or compost piles are exposed. Dogs, cats, and wildlife that come in contact with these substances are at risk. On a larger scale, entire ecosystems are at risk as acrylamide is water-soluble and can easily enter watersheds.

One of the greatest pleasures of gardening is getting your hands into good, rich soil and breathing in its aroma. I believe that the increased, and indiscriminate, use of polyacrylamide hydrogels is an extremely serious hazard to human health and to the environment.

The Bottom Line

- Hydrogels are organic compounds that will degrade after 2-5 years; they are not a long-lasting solution to droughty conditions
- Exposure to fertilizer salts will increase the degradation rate of hydrogels
- When hydrogels degrade, one of the byproducts is acrylamide, a deadly neurotoxin and potential carcinogen
- Acrylamide can be absorbed through the skin or by inhaling; people who have a likely risk of exposure to this compound absolutely require safety clothing and dust masks
- There are safe (albeit shorter-lived) alternatives to polyacrylamide hydrogels, including starch-based gels and others currently used in cosmetic surgery
- There are other environmentally sound ways to reduce water usage and improve water retention of soils than through hydrogels

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