"WEAR"-ing Out the Earth - The Effect of Chemicals and Heavy Metals From Textiles on Hydroponic Plant Growth, and Absorption of Anionic Clothing Dye From Water

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Wastewater runoff from textile industries – especially in regions with high amounts of both textile and agricultural production (typically east-Asian countries) – can seep into groundwater and crop irrigation systems, and/or affect nearby aquatic life. These regions often do not have funding and infrastructure in place to treat their wastewater streams. This study aimed to determine the abiotic stress of chemicals, microplastics, and heavy metals from textiles, on plant growth, to establish their environmental and agricultural impact, and potentially develop a low-cost remediation method for these residues. This was tested by using water with four different types of clothing residues, each with a different material composition, to hydroponically grow radish seeds. It was hypothesized that clothing made from organic cotton would foster the most plant growth, and clothing made from synthetic polyester would foster the least. Data was collected by measuring stem and root lengths, which were made into bar graphs for analysis. It was found that initial preservative chemicals on all the clothes, including that made from organic cotton, ended up either stunting stem and root growth, or mimicking crop fertilizers and initially stimulating it, but later leading to nutrient imbalances/toxicity. One water sample contained lots of clothing dye, carrying lead (toxic heavy metal), with it. Hence, a dye-remediation theory (using Rit aquamarine anionic dye) was tested on the clothing-leached water using a combination of probiotic and Glutathione pills, which formed a sediment, and were able to successfully absorb the dye from water, along with a few other toxins.

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