Clean Clothes, Contaminated Conditions: Fabric as a Source of Plastic Microfiber Pollution

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Microfibers are tiny threads of plastic and a large contributor to plastic pollution. Millions enter the environment through washing machine effluent. Fiber shedding can be reduced by altering clothing content, but the materials that shed the most are unknown. The objective of this project is to quantify the amount of fibers shed by various fabrics and analyze why certain materials shed more than others. It is hypothesized that exclusively synthetic fabrics will shed the most because they are composed of continuous filaments weaved more loosely than semisynthetic and natural fibers. Eight different textile samples were agitated on a hot plate with a magnetic stir rod. Nile Red dye was added to stain the fibers. The fiber-filled water was run down a filtration system of successively finer screens. The screens were viewed under a microscope with blue light to fluoresce the fibers. The fibers were counted in five different locations on each screen. Rayon shed the most in total, as well as the greatest number of large (>177 μm) and small (37 – 74 μm) fiber sizes. Nylon shed the second most in total, with consistently high counts of all fiber sizes; modal shed a comparable amount in total due to its rapid increase in small fibers shed. The remaining fabrics' fiber counts declined in the following order: cupro, linen, polyester, cotton and acrylic. The research quantified release of microfibers and compared shedding behavior between different fabrics. The hypothesis was not supported and instead suggested semisynthetic fabrics release the most fibers. However, the results still show all types of fabric significantly contribute to fiber pollution. Apparel industries must alter textile design or manufacture a new style of fabric in order to reduce plastic pollution.

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