Study on Ultraviolet Protection in Cotton Fabric Dyed With Vegetable-Based Colorants

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Exposure to solar ultraviolet (UV) radiation is directly related to skin cancer. In order to avoid the consequences of continuous exposure to solar radiation, products such as protective clothing may be used. The UV protection of clothing is usually determined and classified according to the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). In addition to coloring, colorants may increase protection of fabrics. Dyes used in textile industries are responsible for a great water pollution. This work investigated vegetable-based colorants with considerable UV protection, while also providing a more environmentally friendly option. In this project, a white 100% cotton fabric was dyed by infusion with colorants extracted from onion peel, red cabbage and beetroot using different concentrations. The samples were studied by diffuse transmittance spectroscopy and the average transmittance in the UV, UVA and UVB regions, as well as the Ultraviolet Protection Factor (UPF), were determined. The undyed fabric has an average UV transmittance of around 24%. Among colored fabrics, those dyed with colorants extracted from onion skins presented the best UV protection results. These samples presented an average UV transmittance below 1,5% and UPF 50+, which is the highest rating in the ARPANSA standard. The fabric colored with red cabbage presented average transmittance in the UV region among 9% and 3% and UPF between 15 and 50+. Fabric dyed with beetroot colorant presented a UV average transmittance between 11% and 4%. These results revealed that clothes dyed with the colorants extracted from red cabbage, onion skins and beetroot may have a pleasant color, offer a more sustainable alternative to manufacturing and provide excellent protection against solar radiation.

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