Title: Upcycling colored brush fiber waste through siro yarn production: A sustainable approach to reduce environmental impact in textile manufacturing

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Abastact Growing environmental concerns, stricter sustainability regulations, and rising raw material costs have accelerated interest in textile waste recycling. This study investigates the use of colored brush fiber waste (CWBF), generated during the sueding process, to produce siro yarn without mechanical recycling. Twelve yarn samples were developed—nine with varying CWBF blends and three virgin cotton control yarns. The CWBF, collected in tuft form, was fed directly through carding machine. Yarn properties were assessed using evenness and tensile tests, along with optical microscopy and SEM. Statistical analyses, including full factorial regression and correlation analysis, identified significant factors affecting yarn quality. A 12.5 % CWBF blend was found optimal, offering substantial environmental benefits—saving 1559 liters of water, 4.8 kWh of energy, and reducing 2.2 kg of CO_2 per kilogram of CWBF used. Fabrics were also made to confirm the yarn's suitability for apparel applications, demonstrating CWBF's potential as a sustainable raw material for siro yarn production.

Keywords: Sustainability Yarn Valorization Recycling Natural fiber Textile waste Cotton fiber Upcycling

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