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CHARACTERISTICS OF DIFFERENT SUBSTRATE PRINTED WITH GRAPE POMACE EXTRACT (*Vitis vinifera* L.)

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Introduction

Plant extracts used in textile processing not only dye the fabric but also enhance its quality and broaden its practical applications. The use of plant extracts in textile finishing is favored due to the eco-friendly process, safety for skin contact, and effective antimicrobial properties that prevent further microbial growth (Grujić et al., 2021).

Antimicrobial paper has been developed to resist microbial attacks, improving food packaging protection. Effective antimicrobial finishing must provide lasting resistance to washing, drying, and rinsing without harming the fabric or affecting moisture transfer properties (Malpani, 2013).

Environmental awareness has led to the exploration of natural dyes for textile dyeing and printing. These dyes, extracted from plants, offer advantages such as non-toxicity, antibacterial properties, UV protection, biodegradability, and renewability.

Methods

A semi-automatic Screenprinter S300 screen printing system was used to print the material. Each sample was printed in two passes at a speed of 0.08 m/s on a 10 threads/cm screen. Spectrophotometric measurements were conducted with Konica Minolta CM-2600d spectrophotometer. For dielectric properties the sample was treated by a sinusoidal voltage of amplitude 1 V, at a room temperature with the frequency range from 20 Hz to 120 kHz. The measuring bridge Hameg 8118 was used. The antibacterial effect of the samples after printing was investigated by the agar diffusion method. The following microorganisms were used for testing: *Staphylococcus aureus* ATCC 25923 and *Escherichia coli* ATCC 25922. Bacterial cultures were grown on nutrient agar. A suspension of cultures in physiological solution was prepared for testing. The density of *Staphylococcus aureus* and *Escherichia coli* was adjusted spectrophotometrically to about 10^5 cfu/mL. FTIR spectroscopy was performed on Shimadzu IRAfinity-1S in wavelength range 700 cm^{-1} to 4000 cm^{-1} on room temperature.

Results

Table 1: Color coordinates of printed samples

Sample	L*	a	b	C	h
Paper	93.99	2.36	-9.89	10.17	283.44
P-50E	86.29	2.16	5.78	6.16	69.43
P-100E	83.21	3.58	9.82	10.46	69.96
P-200E	82.84	3.98	10.06	10.81	68.43
Textile	93.69	3.17	-13.03	13.41	283.67
T-50E	91.66	1.95	-6.16	6.46	287.55
T-100E	89.72	2.59	-2.18	3.40	320.38
T-200E	88.87	3.14	-0.21	3.21	4.11

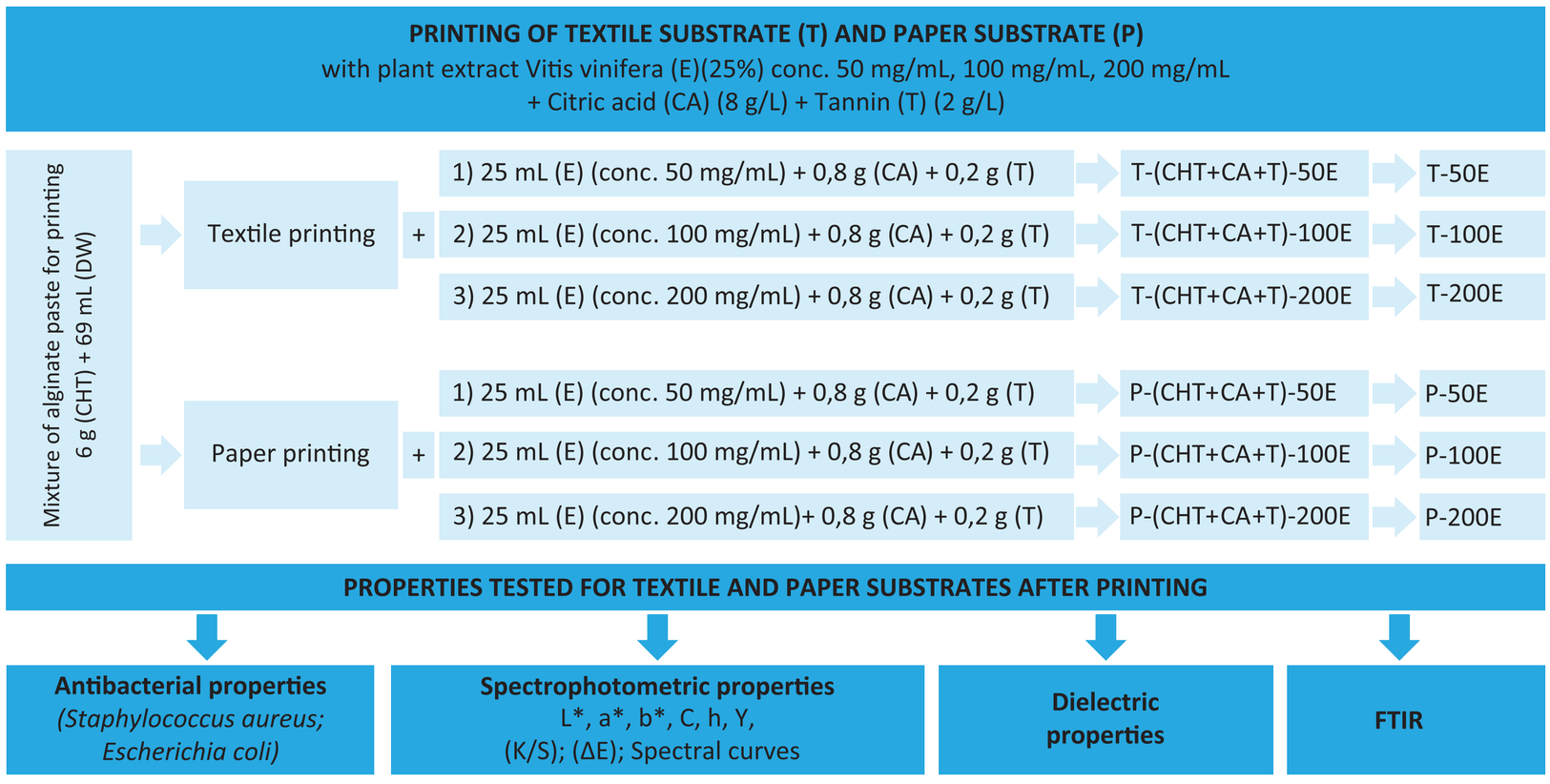

Figure 1
Experiment plan

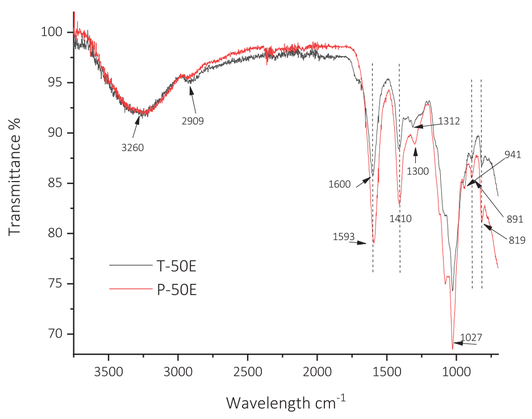

Figure 2
FTIR spectra of unprinted samples

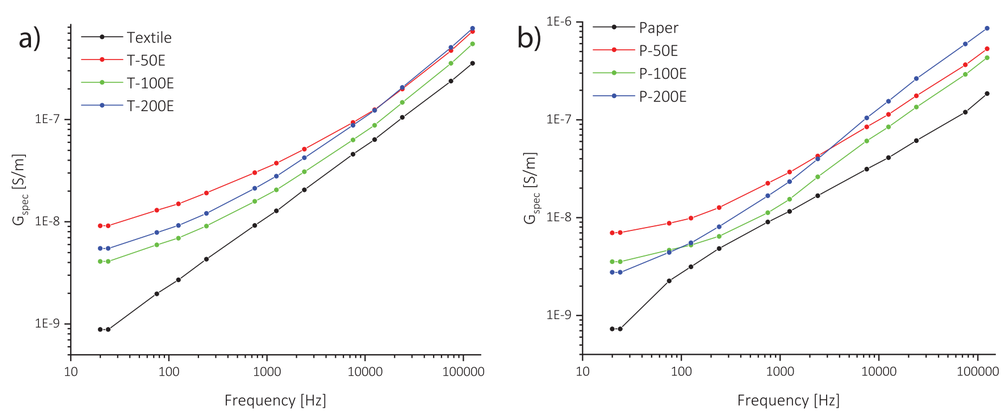

Figure 3
Dielectric properties of printed (a) textile and (b) paper samples

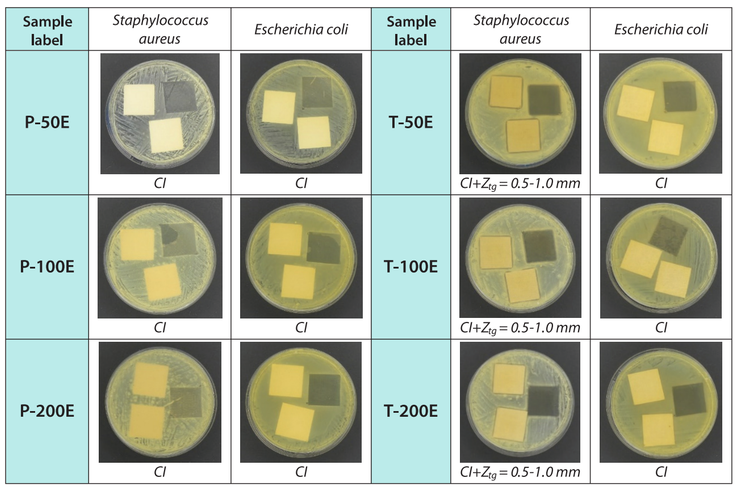

Figure 4
Antibacterial properties of printed samples

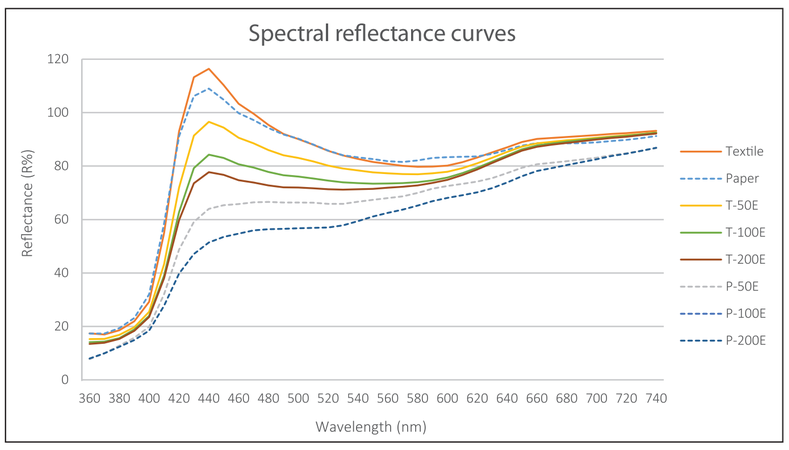

Figure 5
Spectral curves of printed samples

Conclusion

The research explores an eco-friendly method of utilizing grape pomace (*Vitis vinifera* L.), a byproduct of the winemaking process, to enhance the properties of printed textiles and paper.

By combining modified alginate paste with grape pomace extract, the aesthetic and functional qualities of these materials are significantly improved.

This approach not only reduces waste from the wine industry but also introduces antibacterial properties, offering potential for innovation in both the textile and packaging industries.

The study provides a basis for developing new, sustainable products with enhanced functional and visual characteristics.

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