Finding a New Standard for Rolled Cotton in North American Paintings Conservation

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BACKGROUND & INTRODUCTION

When Johnson & Johnson discontinued the production of the 6026 Red Cross Cotton Roll in 2004, many in the paintings conservation community were at a loss. This cotton product was a preferred cotton for surface cleaning and varnish removal, famous for its sterile quality, long fibers and handling properties. Since Johnson & Johnson's change in cotton manufacturing, paintings conservators have been searching for a suitable replacement, even to the present day.

This research compared those aforementioned characteristics that made Johnson & Johnson's 6026 Red Cross Cotton famous. A small remaining sample of this cotton was compared against selected cottons to determine their effectiveness in painting conservation. The cottons were chosen from art conservation suppliers and a local drug store brand, along with a remaining sample of cotton from Robinson Healthcare of Chesterfield in the United Kingdom that had similar properties as the Johnson & Johnson cotton. All have undergone either sterile or non-sterile cotton processes, and contain either bleached or non-bleached fibers. Experiments carried out are listed below.

SAMPLES	COTTON BRAND	SUPPLIER	PURCHASE DATE
1	Practical Cotton	Talas, NY	January 2009
2	Mansfield Medical Distributors Ltd.	Lovell Drug Store, Canada	November 2011
3	Conservation Support Systems	CSS, California	November 2011
4	PADCO	Talas, NY	January 2012
5	Webril-Handi pads	Carr Mclean, Canada	September 2009
6	6026 Red Cross	Johnson & Johnson	Approx earliest date 2001
7	Best No. 6, Code 20850	Robinson Healthcare of Chesterfield, UK	1998

EXPERIMENTAL

FIBER IDENTIFICATION
- Microscopy (normal illumination and polarized light)
- Fourier transform infrared (FTIR) spectroscopy

FIBER CHARACTERISTICS
- Texture
- Tear ability
- Trash and nep content (debris and entangled cotton fibers)
- Colorimetery using CIELAB $L^*a^*b^*$ System, focusing on L^* and b^* measurements
- Length and length uniformity

METALLIC CONTAMINATION TESTING
- Inductively coupled plasma optical emission instrument (ICP-OES, also known as ICP-AES) to search for the presence of 30 metals (detects trace amounts in parts per billion)
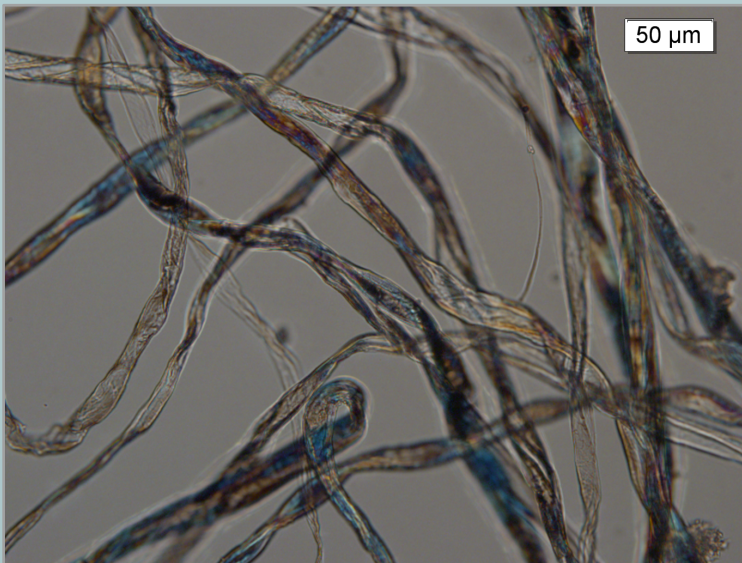
ABSORBENCY
- Seven swabs from each sample were tested for their ability to absorb distilled water. Swabs were weighed using an analytical balance before absorption, rolled onto a bamboo stick, dipped in distilled water, then rolled five times to remove excess water, then weighed after absorption using an analytical balance. Residual water left on the balance after the wet swab was removed was also weighed.

USABILITY
- Each sample was tested five separate times on two different canvases (one textured and one smooth) to determine varnish removal capabilities and determine the number of cotton fibers left behind on the painting's surface. Test canvases were pre-primed commercial canvases painted with Golden carbon black acrylic paint and spray varnished with Liquitex Soluvar® Gloss Varnish in mineral spirits (30%). Varnish removal was performed with pre-weighed swabs and mineral spirits. Each of the ten tests were limited to a canvas area of 1.5 inches^2.
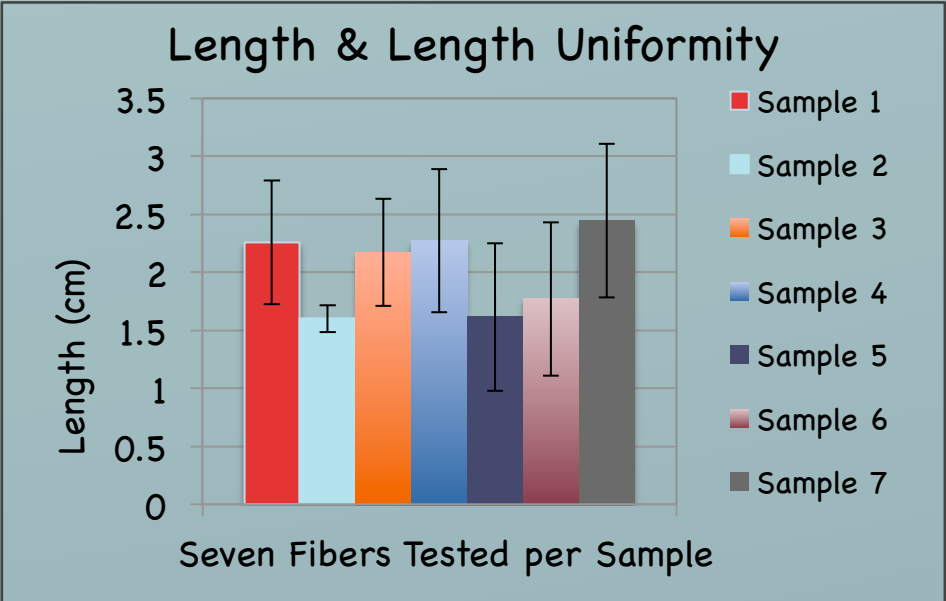

Sample 6 at 40x magnification, under polarized light microscopy.

RESULTS & CONCLUSIONS

SAMPLES	FIBER ID	FIBER CHARACTERISTICS	METALLIC CONTAMINATION (trace amounts below 1%)	ABSORBENCY (average in grams)	USABILITY*
1	Cotton	Soft but not smooth, hard to tear, minimal trash content Color: L^*=92.62, b^*=+1.32 (yellow)	Ca, K, Mg, Na, P, S	6th (1.0495)	4th; Easy to make swab & roll
2	Cotton	Coarse, hard to tear, high trash content Color: L^*= 91.44, b^*= +3.28 (yellow)	Highest trace levels of Ca, Fe, K, Mg, Ma, Na, P, S, Sr, Zn	1st (1.2403)	2nd; Dense, harder to make swab, easy to roll
3	Cotton	Soft and fluffy, slight resistance to tearing, minimal trash content Color: L^*= 94.77, b^*=+0.19 (minor yellow)	Ca, K, Mg, Na, P	4th (1.192)	6th; Easy to make swab & roll
4	Cotton	Soft, medium tear ability, minimal trash content Color: L^*= 94.94, b^*= +0.53 (yellow)	Ca, K, Mg, Na, P	3rd (1.2108)	3rd; Dense, harder to make swab & roll
5	Cotton	Compact, soft, easier to tear but have to removed padded edge first, minimal trash content Color: L^*= 94.42 (outside), 82.19 (inside); b^*= +0.88 (exterior) (yellow), -0.49 (interior) (blue)	K, Na	5th (1.1847)	1st; Semi-easy to make swab & roll
6	Cotton	Soft, medium tear ability, minimal trash content Color: L^* 93.96,b^*= +1.79 (yellow)	Ca, K, MG, Na, S	2nd (1.225)	7th; Easy to make swab & roll
7	Cotton	Soft but not smooth, minimal trash content Color: L^*= 92.11, b^*= +4.02 (yellow)	Ca, K, MG, Na, P, S	7th (0.9932)	5th; Easy to make swab & roll

*USABILITY rankings are related to the average number of fibers left behind on a 1.5in^2 area of canvas during varnish removal.

Length & Length Uniformity

All Samples shared the following characteristics:
- High visible nep content
- Mature and immature cotton fibers
- Trace amounts of metals found in nature
- Similar color brightness
- Similar absorbencies
- Loose fibers on swabs during varnish removal

Conclusions
- Sample 6 did not perform as well as expected, maybe due to older sample
- Sample 5 left the least amount of fibers behind on Test Canvases 1 & 2 during varnish removal
- Sample 2 had the shortest fibers but also the most uniform fibers
- Samples 5 & 7 made the most compact swabs during varnish removal
- Although Sample 2 has the highest absorption, it is least recommended due to coarse and dense fibers
- Highly recommend Samples 3 & 5

ACKNOWLEDGEMENTS