

**INVESTIGATION OF THE
INTERACTION OF REMAINS
AND TEXTILES IN SOIL
GRAVES**

By

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Certificate of Authorship and Originality

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of the requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all the information sources and literature used are indicated in the thesis.

Date: 17.12.2015

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List of Abbreviations and Symbols

ADD	Accumulated degree day
ATP	Adenosine triphosphate
ATR	Attenuated total reflectance
CDI	Cadaver decomposition island
ECD	Electron capture detector
FID	Flame ionization detector
FTIR	Fourier transform infrared
GC	Gas chromatography or gas chromatograph
ID	Inner diameter
MS	Mass spectrometry or mass spectrometer
N	Molar concentration
NIST	National Institute of Standards and Technology
NSW	New South Wales
PC-1	First principal component
PC-2	Second principal component
PCA	Principal component analysis
PET	Polyethylene terephthalate
PMI	Post-mortem interval
RAAF	Royal Australian Air Force
RPM	Revolutions per minute
TEA	Thermal energy analyser
UV	Ultraviolet
VWC	Volumetric water content

Abstract

Textiles are a common source of evidence in forensic scenarios and can provide valuable insight into a crime event. In the past research has focused mainly on the effect of the presence of clothing on the decomposition timeline of the remains used to estimate time since death, rather than how remains affect the textiles. The hypothesis is that the presence of decomposing remains will alter the degradation patterns of textiles. It is therefore suggested that analysing textile samples collected from a crime scene might give further information about the post-mortem or post-burial interval. This is particularly valuable when only clothing is recovered from a scene.

In order to investigate textile degradation patterns associated with remains, clothed pigs were either buried or placed directly on the soil surface. Clothing in the absence of remains were also collected and analysed for comparison purposes.

The clothing samples were analysed using Attenuated total reflectance Fourier transform infrared (ATR-FTIR) spectroscopy in order to investigate any chemical damages to the textiles, in addition to looking at the presence of decomposition fluid. Samples from certain sampling days were analysed using Gas chromatography-mass spectroscopy (GC-MS) for the further elucidation of the lipid profile absorbed by the textile samples associated with decaying remains.

At the completion of the project it was confirmed both visually and through the chemical analysis that the natural textile degradation in a soil environment was inhibited in the presence of decomposing remains. Principal component analysis of the data obtained for cotton in absence of remains demonstrated a clear separation in the data sets and degraded samples could clearly be distinguished from the non-degraded ones. Seasonal variety was determined to be a factor in the timeline of textile degradation of the natural material.

The apparent inhibition of the degradation of natural textiles associated with the decomposing remains is a significant finding. It suggests that the processes leading to the release of decomposition fluid into the environment might play an important role in the textile degradation timeline. Investigating the textile degradation stage as well as analysing the lipid composition will provide invaluable information for the resolution of future cases of clandestine deaths.