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Title: Pesticide residues on herbarium sheets housed within The National Museum and Galleries of Wales

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cycle. In October 1995, the floor space was sprayed with encapsulated Empire 20, as a further precaution to stop the spread of beetles.

Although activity is negligible, a spot check in May 1997 revealed some heavily infested jars of *Plantago* and *Chenopodium* seeds (with close fitting plastic lids). There was no apparent activity, but on removal from the store to a warm office for a few days, two live beetles emerged. This suggests that the pupae can survive for long periods of time in a dormant state.

The method has proved a successful management technique, involving minimum interference with specimens, for a severe pest problem in a difficult storage space.

Naomi Rumball
Sir Joseph Banks Building
Royal Botanic Gardens, Kew

Pesticide Residues on Herbarium Sheets Housed Within The National Museum and Galleries of Wales

The National Museum and Galleries of Wales (NMGW) Biodiversity and Systematic Biology department houses 250,000 vascular herbarium specimens, many dating back to the 18th century. Vascular material is prone to attack from pests. If the conditions are suitable the pest will spread very quickly, stripping the dried material. This can be devastating to a collection, as important characteristics and data can be lost. Institutions and collectors have overcome this problem through applications of pesticides. However, the types of chemicals applied since the beginning of the 20th century are now known to be harmful and could present a possible risk to staff and visitors handling the collections.

The aim of this project is to attempt to identify organic and inorganic pesticide residues found on herbarium sheets. These will relate to what the specimen itself has been treated with. The preferred analytical techniques to be used include spot tests, Atomic absorption spectroscopy (AAS), Mass Spectrometry (MS) and Energy Dispersive X-rays (EDX). The results should correlate certain pesticides with dates, collectors, institutions or even species. The results will be accumulated and a comprehensive data list made available, informing other institutions of what may be on their own herbarium sheets.

Prior to analysis, various herbarium specimens, including type specimens, were remounted using conservation grade materials and the original sheet was taken for testing. Numerous heavy metal spot tests were conducted to determine presence of arsenic and mercury and initially, these results appeared ambiguous. It was decided that a more precise method of analysis should be used on a few samples to determine the exact concentrations of residues present. Dr Trevor Brown of the Department of Chemistry, Derby University, carried out Inductively Coupled Plasma-MS and EDX analysis on five small samples of herbarium paper to verify presence of inorganic material. EDX is a surface technique which has been used in the past to verify the presence of arsenic and mercury residues found on taxidermal specimens. This method was found to be far too insensitive for analysing herbarium specimens as the pesticide was often applied as a liquid or spray which would then soak into the specimen and the sheet below becoming an intrinsic part of the fabric and not simply remaining on the paper surface. ICP-MS requires complete digestion of the paper and identifies all inorganic material throughout the paper, allowing an accurate measure of concentration to be made. The ICP-MS results were conclusive. The five herbarium samples were dated from 1848-1964 and each gave a positive result for both mercury and arsenic. Mercury was present in high concentration but the arsenic was generally much lower. Further spot tests were carried out and this time it was possible to measure, by eye, the very slight difference in colour intensity of the reagent and the samples. The spot tests did correlate with the ICP-MS results, but the sensitivity of these spot tests is far less than those carried out on taxidermal specimens. The sensitivity for the taxidermal tests should be 0.05 ug of mercury, but the value for these experiments was closer to 6 mg of mercury.

Future plans will involve providing standards of well-known pesticides

and comparing these with the organic results of the sheets using ICP-MS. Also a questionnaire will be drawn up for institutions around the world to relate their pest control procedures with the findings of this project.

Vicky Purewal
National Museums & Galleries of Wales

Low Temperature Treatment at the Victoria and Albert Museum

Textiles are routinely treated by freezing at the Victoria and Albert Museum. This is an integral part of the Museum's insect pest management strategy. Our strategy for the control of insect pests has evolved since 1989. It includes a trapping and monitoring programme, where sticky insect traps are placed in the galleries and stores of the Textiles and Dress collections, along with the Furniture and Woodwork collections. All other disciplines have been involved but there are insufficient resources available to fully monitor the whole museum site. Insect activity is recorded for two species of carpet beetle, the Guernsey carpet beetle, *Anthrenus sarnicus* and the brown carpet beetle, *Attagenus smirnovi*. In addition, there is an ongoing programme of deep cleaning in galleries and stores, with the use of insecticides where appropriate.

Two exhibitions recently opened at the V & A, contain material treated by freezing, 'The Colours of the Indus', an exhibition of textiles and costume from Pakistan, 9 October - 29 March and 'Carl and Karin Larsson, The Swedish Style', 23 October - 18 January 1998. The inclusion of exhibition items in a freezing programme controls infestation and prevents insect pests from being transferred within and between exhibition/storage sites. All new proteinaceous and textile acquisitions are treated similarly.

Low temperature treatments were initially introduced at the V&A as an alternative to using chemicals hazardous to health. The first freezing project in 1990 was implemented in direct response to an infestation of carpet beetle larvae. The following year there was a much larger programme of treating over 500 tapestries and carpets, prior to their move from an old basement store to a newly outfitted store at Blythe House, which was insect-pest free. Several freezing programmes have been carried out since then, either using a large, hired freezer unit or a domestic chest freezer. The chest freezer is situated at the Blythe House store in a room with sufficient space for the preparation of objects for freezing. The chest freezer is left on at all times and can therefore be used either for emergency treatments or for planned programmes.

Methodology for treatment using the large hired unit and the chest freezer is similar. All the textile objects are first wrapped in acid free tissue or polyester wadding. They are then wrapped in stout polythene which is secured with parcel tape over a double seam and then clearly labelled. In the large unit, objects are placed on racking shelves or palettes and in the chest freezer they are laid on to sheets of Plastazote. All objects are treated for a period of four days at a temperature of -30°C. After the objects are removed from the unit they are left untouched and unopened for a further two days. Any condensation forms on the outside of the packet and not on the inside. The objects are then unwrapped, condition checked and, where possible, vacuum cleaned to remove any insect remains that may provide an additional food source for insect larvae. The textile objects are then prepared for storage or display.

Val Blyth
Textiles Conservation
Victoria and Albert Museum

Pesky Moths! -controlling an outbreak with the aid of pheromones.

Introduction

At the end of 1995 an outbreak of the clothes moth *Tineola bisselliella* occurred in an open natural history diorama exhibit at the National Museum and Gallery of Wales (NMGW). What immediately followed was an example of poor communication and poor protocol. Eventually the infestation was controlled with a combination of pesticide treatments and pheromone traps, and without the need to close the gallery for more radical treatments. However a number of specimens were lost and the infestation