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Summary

Two separate studies into dyes in textiles from Baynard's Castle have been carried out, one by Prof. M. C. Whiting and the other by P. Walton: a total of 217 textiles have been examined, out of which 140 gave positive results. Madder was by far the most common, but indigotin, kermes, lichen purple and some unidentified yelow/brown dyes were also found in smaller numbers. The techniques of analysis are briefly described and the history of each dye is examined.

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DYES IN TEXTILES FROM BAYNARD'S CASTLE

Introduction

In 1978 Professor M.C.Whiting of the University of Bristol undertook a search for dyes in a random sample of textiles from the Baynard's Castle site. This was the first time that modern techniques of dye analysis had been applied to the heavily soil-stained kind of textile which is generally recovered from wet archaeological sites. The work of the Bristol team was of great significance in establishing that small amounts of dye can be detected in such finds, even though the original colour has faded and been swamped by the brown of tannins and humic acids. In all, 34 out of the 58 textiles in this preliminary study proved to contain detectable dye - enough to suggest that a more systematic sampling of a larger group of finds would be worthwhile.

Samples were taken from a further 159 textiles, so that the two studies together covered 217 textiles, representing a cross-section of all the different fabric-types in the collection. As time and funding were no longer available to the Bristol team, the second group of samples was sent to the York laboratory, where the present author carried out dye analyses using the techniques developed by Prof.Whiting. Thanks are due to Prof.Whiting for providing details of the system and to Dr G.W.Taylor for his refinements to the Bristol methods of analysis. The project was funded by HBMC (English Heritage) and the spectrophotometer on which the work was carried out was generously loaned by Perkin-Elmer Ltd (Bucks).

Method of Extraction and Identification

The procedure for the extraction of dyes has been described elsewhere (1). In brief, small samples of the textile are divided into two and one half treated in a strong solvent, in order to extract dyes which have been applied directly to the fibre (e.g. woad, indigo and lichen purple). The other half is treated in an acid-plus-alcohol mixture, which will remove dyes which have been applied after the fibre has been pre-treated with a metal mordant (madder, kermes, brazilwood and several of the yellow dyes are of this sort).

The two liquid extracts are further refined and developed and then run on a U.V./Visible spectrophotometer. This machine draws up a graph of how light is absorbed at different wavelengths as it passes through the sample. The spectrophotometer graphs can be compared with those of known dyestuffs and this often provides an immmediate identification. However, as further confirmation, the ether extracts may also be used in chromatography. Samples of the dye extract are spotted onto paper or Thin-Layer Chromatography plates (2). The chromatogram is then placed upright in a jar containing a small amount of solvent and left until the solvent has crept up to almost the full length of the plate. When taken out and sprayed with a developer such as potassium hydroxide, spots appear at different places on the chromatogram, indicating the different constituents of the dye:

for example, alizarin and purpurin, the main components of dyers' madder may be identfied in this way.

Results

Out of the 217 textiles examined in the Bristol and York studies, 140 (64.5%) gave positive results. The dyes proved to be madder, kermes, indigotin, lichen purple, with one tentative identification of brazilwood and several examples of a yellow or brown dye which could not be firmly identified.

By far the most common dye was madder, which was present in 37% of the 1330-1340 group (TA), 61% of the late 14th century group (TB and TBX) and 24% of the mid 16th century group (TC). Alizarin was present in all the madder samples examined by chromatography: this indicates that the dye was almost certainly from the roots of dyers' madder, Rubia tinctorum, rather than the native wild madder, R.peregrina, or any of the British bedstraw dyes, all of which have been shown to lack any detectable alizarin (3).

Madder is a versatile dye, usually used for a warm brick-red, although it can also produce peach, yellow, brown and tan. In five cases (one from TA and three from TB) the dye had been combined with blue, to give purple or black; in another (from TBX), some madder-dyed threads had been overdyed with yellow, to form an orange or brown selvedge-stripe in a yellow cloth.

It is probable that the plant R.tinctorum, although not native to this country, had been introduced before the Norman Conquest and was being cultivated extensively in the first half of the medieval period(4). 'Waranciers', traders or dyers in madder, were resident at Winchester in 1148 (5) and there are records of madder being grown in the Beverley area in 1331 (6), while legislation of the early 14th century forbade the export of the dye (7). By the 15th century additional supplies were being brought in from the Low Countries, where madder-growing was to become a speciality (8). Both the Bristol and York tests showed that the proportions of the two major dye-components, alizarin and purpurin, varied considerably from sample to sample, which Prof. Whiting took to indicate a range of sources for the dye - although the possibility that the method of dyeing might alter the ratio should also be considered.

Kermes, another red dye, was detected in a small number of the better quality fabrics (TA45, TA236, TB238 and TB407). Kermes is derived from the kermes shield-louse, Kermes vermilio (Planch.) a Mediterranean insect which was imported into this country under the name of 'grain'. Kermes was expensive but much-prized for the rich scarlet which it gave: it was always associated with rank and has been found in several ecclesiastical burials of the medieval period (9).

A third red dye which might be expected in any large group of medieval textiles is brazilwood, obtained from the heartwood of trees of the Caesalpinia family. This dye seems to have been

imported into Europe from at least the late 12th century (10), but there is only one tentative identification at Baynard's Castle (TA19). It is also rare in other excavated textiles, although it has been encountered in larger numbers in textiles surviving above-ground (11): it seems most likely that the dye decomposes during burial in such a way as to be undetectable.

A purple dye derived from lichens was also encountered in two silks (TB91 and TB127) and more tentatively identified in a felt (TC125); it has also been found in a small number of other Dark Age and medieval textiles, generally of good quality. The dye may be obtained from a number of different lichens, some of which, such as Ochrolechia tartarea, can be found growing in north-west England and Scotland. These lichens appear in the 13th century Consuetudinary of Winchester under the name of 'cork' (12) and as 'lacmus' they were imported from Norway in the 14th century (13). By the 15th century a similar dye, derived from Mediterranean lichens, was being traded as a Florentine monopoly under the name of 'orchil' (14).

Historians may be surprised to discover that indigotin, the blue colorant derived from woad and indigo (the two sources are chemically indistinguishable) was rare among the Baynard's Castle textiles. Woad is so commonly mentioned in trade documents of the period (15) that it might be expected in larger numbers of finds. The explanation may be that weak dyeings with woad fade and are difficult to detect after long-term burial. At any rate, it is interesting that indigotin is more commonly detected in 16th and 17th century textiles, after the richer dye-source, indigo, had ben introduced (16).

Yellow and brown dyes are even more difficult to detect in archaeological samples, as they are masked by staining from the soil. Traces of yellow and brown dyes were found in nine of the Baynard's Castle textiles, but in no case was it possible to be certain of the dye-source. All of the nine were yellow on extraction, but they may have been tannins, in which case they were probably brown when applied to the fibre.

Finally, mention should be made of a mysterious purple colorant which appeared in three of the textiles from the 16th century collection (TC). This could not be identified with any of the well-known purple dyes, but was eventually matched with the juice of ripe elderberries. Elderberries have occasionally beeen used in the past as a dye (17), but never commercially as the dye has poor light-fastness. On balance it seems more probable that the purple colour has come from berries buried on the site and accidentally brought into contact with the textiles.

In summary, the dyes in the Baynard's Castle textiles showed a predominance of reds. Purples and blues were also present in small numbers and also yellows and browns and possibly black. However, there still remain the 35.5% in which no dye was detected. It is possible, of course, that these were originally white and undyed, yet it seems more likely that some at least

were once dyed, perhaps with brazilwood or one of the yellow dyes, or even with woad. Refinements to the analytical system are still being developed and it is possible that in the future the numbers of negative results will begin to be reduced. Meanwhile the work has already demonstrated that the rich warm red tones of madder were among the most popular colours worn by the well-to-do in medieval England.

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