Data Article

Dataset supporting the identification of natural dyes in yellow, orange, brown and green fibres from Krakow liturgical vestments

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A R T I C L E   I N F O

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A B S T R A C T

This data article provides an extensive and complete description of the colorants and dyes identified in fibre samples taken from the historical textiles that were described in the article "Universal analytical method for characterization of yellow and related natural dyes in liturgical vestments from Krakow" by K. Lech [1]. Natural organic dyes, for centuries used to dye fibres, contain usually from a few to several dyeing compounds. The correct identification of the dye requires at first the identification of their colouring components using sensitive and selective analytical techniques. One of this technique is high-performance liquid chromatography combined with spectrophotometric detection and detection using tandem mass spectrometry with electrospray ionization (HPLC-UV-Vis-ESI MS/MS). The HPLC-UV-Vis-ESI MS/MS protocol was used to identify natural dyes present in 89 yellow, orange, brown and green fibres taken from 15th- to 17th-century silk textiles used in vestments belonging to the collections of seventeen churches in Krakow, Poland.

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Specifications table

| Subject                                    | Analytical Chemistry                        |
|--------------------------------------------|---------------------------------------------|
| Specific subject area                      | Identification of yellow, orange and brown dyes natural in historical textiles |
| Type of data                               | Raw LC-MS data                              |
| How data were acquired                     | High-performance liquid chromatograph (1220 Infinity II LC System, Agilent Technologies) coupled with two spectrophotometric detectors (1220 Compact VWD and 1200 VWD, Agilent Technologies) and tandem mass spectrometric detector (6460 Triple Quad LC/MS with JetStream Technology, Agilent Technologies) |
| Data format                                | Raw and analysed                            |
| Parameters for data collection             | Yellow, orange, brown and green fibres from 15th- to 17th-century silk textiles used in the vestments belonging to the collections of seventeen churches in Krakow |
| Description of data collection             | Fibre extracts were analysed on the presence of natural colourants by HPLC-UV-Vis-ESI MS/MS using positive and negative dynamic multiple reaction monitoring (dMRM) modes. Brown and green fibres were extracted twice with DMSO and with acidic-methanol solution, whereas yellow and orange fibres were extracted only using the second procedure. |
| Data source location                       | Faculty of Chemistry, Warsaw University of Technology, Warsaw, Poland |
| Data accessibility                         | With the article                            |
| Repository name: Mendeley Data             | Data identification number: 10.17632/w24kygn7p8.1 |
| Direct URL to data: https://doi.org/10.17632/w24kygn7p8.1 | Related research article                    |
| Lech K., Universal analytical method for characterization of yellow and related natural dyes in liturgical vestments from Krakow, Journal of Cultural Heritage (In Press) [1] |

Value of the data

- These data support identification of natural dyes in historical vestments by identification of the colourants using HPLC-UV-Vis-ESI MS/MS
- The dataset informs on natural dyes used in historical textiles from the 15th to the 17th centuries
- These data can be valuable for conservators and art historians
- The dataset increases knowledge on the historical vestments from Krakow churches

1. Data Description

Twofold extracts of 89 yellow, orange, brown and green fibres taken from historical textiles have been examined by HPLC-UV-Vis-ESI MS/MS using previously developed method [1] in dynamic multiple reaction monitoring (dMRM) mode. The silk textiles are dated from the 15th to the 17th centuries and they have been used in vestments belonging to the collections of seventeen Krakow churches. The DMSO extracts have been analysed using positive ion mode, whereas methanol-water-formic acid extracts have been examined with both positive and negative ion modes. Identification of the colorants have been based on the compatibility of their retention times and MRM transitions with standards and natural dye markers. Acquired results have led to identification of natural dyes in the examined fibres, even though some of them were re-dyed with synthetic dyes. All samples, their details and attributions, as well as identified colorants and dyes are listed in Table 1. Original dataset is available in the repository [2].
| Storage location            | Textile number* | Object*                               | Origin and dating* | Fibre colour | Identified compounds                                                                 | Original dye                  | Remarks                                      |
|----------------------------|----------------|---------------------------------------|--------------------|--------------|--------------------------------------------------------------------------------------|--------------------------------|---------------------------------------------|
| Corpus Christi Basilica    | No. 1          | chasuble, textile from sides          | Europe, the 15th cent. ¹ | green        | luteolin C-hex, carminic acid, genistin, luteolin 7-O-glcr, genistein O-hex,         | dyer’s                        |                                             |
|                            |                |                                       |                     |              | luteolin 0-hex (1), apigenin 7-O-glcr, luteolin 0-hex (2), O-methyl-luteolin 0-glcr, |                                |                                             |
|                            |                |                                       |                     |              | luteolin, genistein, luteolin methyl ether, apigenin, diosmetin, isatin, indigotin, |                                |                                             |
|                            |                |                                       |                     |              | indirubin                                                                            |                                |                                             |
| Church of St Adalbert      | No. 2          | chasuble, textile from sides          | Europe, the 15th cent. ¹ | green        | luteolin 7-O-hex, luteolin 0-glcr (1), luteolin 0-glcr (2), O-methyl-luteolin 0-glcr, | sawwort                        |                                             |
|                            |                |                                       |                     |              | luteolin, apigenin, isatin, indigotin, luteolin,                                |                                |                                             |
| Church of St Francis of Assisi (Monastery Church of the Franciscans) | No. 3          | chasuble, textile from sides          | Europe, the 15th cent. ¹ | green        | luteolin di-O-hex, luteolin 7-O-glcr, luteolin 0-hex (1), apigenin 7-O-glcr, luteolin 0-hex (2), luteolin, apigenin, diosmetin, acacetin, isatin, indigotin, luteolin, | weld + indigo/woad            |                                             |
| Church of St Francis of Assisi (Monastery Church of the Franciscans) | No. 3          | stole, main textile                  | Europe, the 15th cent. ¹ | green        | luteolin di-O-hex, luteolin 7-O-glcr, apigenin 7-O-glcr, O-methyl-luteolin 0-glcr, luteolin, apigenin, diosmetin, acacetin, isatin, indigotin, | weld + indigo/woad            |                                             |
| Church of St Michael the Archangel and St Stanislaus Bishop and Martyr (Monastery Church of the Pauline Fathers) | No. 4          | chasuble, textile from sides          | Europe, the 15th cent. ¹ | blueish green | luteolin di-O-hex, luteolin 7-O-glcr, apigenin 7-O-glcr, luteolin 0-hex (2), O-methyl-luteolin 0-glcr, luteolin, isatin, indigotin, | weld + indigo/woad            |                                             |
| Basilica of Holy Trinity (Monastery Church of the Dominicans) | No. 6          | maniple, main textile                | Europe, the 15th cent. ¹ | green        | luteolin di-O-hex, luteolin 7-O-glcr, apigenin 7-O-glcr, luteolin 0-hex (2), O-methyl-luteolin 0-glcr, luteolin, isatin, indigotin, | weld + indigo/woad            | traces of synthetic dye                    |
| Basilica of Holy Trinity (Monastery Church of the Dominicans) | No. 11         | stole, main textile                  | Europe, the 15th cent. ¹ | brown        | fustin, ellagic acid, sulfuretin, isatin, indigotin                                  | young fustic                  |                                             |
| Basilica of Holy Trinity (Monastery Church of the Dominicans) | No. 11         | dalmatic, front orphrey              | Europe, the 15th cent. ¹ | brown        | fustin, ellagic acid, sulfuretin                                                  | young fustic                  |                                             |

(continued on next page)
Table 1 (continued)

| Storage location                                    | Textile number\* | Object\*                        | Origin and dating\* | Fibre colour | Identified compounds                                                                 | Original dye                      | Remarks                   |
|------------------------------------------------------|------------------|---------------------------------|---------------------|--------------|--------------------------------------------------------------------------------------|-----------------------------------|---------------------------|
| Basilica of Holy Trinity (Monastery Church of the Dominicans) | No. 29           | chasuble, textile from sides    | Europe, the 15th-16th cent. ¹ | green        | luteolin C-hex, **genistein**, **luteolin 7-O-glc**, genistein O-hex, luteolin O-hex (1), apigenin 7-O-glc, luteolin O-hex (2), O-methyl luteolin O-glc, **luteolin, genistein**, luteolin methyl ether, apigenin, isatin, **indigotin luteolin di-O-hex, luteolin 7-O-glc, apigenin 7-O-glc, luteolin O-hex (2), O-methyl luteolin O-glc, **luteolin, apigenin, diosmetin, isatin, indigotin, indirubin** | dyer’s broom + indigo/woad       |                          |
| Church of the Assumption of the Blessed Virgin Mary (Monastery Church of the Camaldolese Monks) | No. 31           | chasuble, textile from sides    | N/A, the 16th cent. ¹ | green        | **luteolin di-O-hex, luteolin 7-O-glc, luteolin 0-hex (1), apigenin 7-O-glc, luteolin O-hex (2), luteolin luteolin di-O-hex, luteolin 7-O-glc, luteolin 0-hex (1), apigenin 7-O-glc, luteolin O-hex (2), luteolin, apigenin, diosmetin, isatin, indigotin, indirubin** | weld + indigo/woad                |                          |
| Basilica of Holy Trinity (Monastery Church of the Dominicans) | No. 52           | cope, textile of cope proper    | Europe, the 16th cent. ¹ | green        | **luteolin di-O-hex, luteolin 7-O-glc, luteolin 0-hex (1), apigenin 7-O-glc, luteolin O-hex (2), luteolin, apigenin, diosmetin, isatin, indigotin, indirubin** | weld + indigo/woad                |                          |
| Church of St Francis of Assisi (Monastery Church of the Franciscans) | No. 58           | stole, main textile             | Europe, the 16th cent. ¹ | yellow       | brazilwood + weld + ellagittannins                                                   |                                   |                          |
| Basilica of Holy Trinity (Monastery Church of the Dominicans) | No. 69           | maniple, textile from the endings | Europe, the 16th cent. or c. 1600¹ | green        | **luteolin di-O-hex, luteolin 7-O-glc, luteolin 0-hex (1), apigenin 7-O-glc, luteolin luteolin di-O-hex, luteolin 7-O-glc, luteolin 0-hex (1), apigenin 7-O-glc, luteolin O-hex (2), luteolin, apigenin, diosmetin, isatin, indigotin, indirubin** | weld + indigo/woad traces of synthetic dyes |                          |
| Corpus Christi Basilica                              | No. 70           | chasuble, main textile          | Europe, c. 1600 ¹     | green        | **luteolin 7-O-glc, luteolin 0-hex (2), luteolin, genistein, luteolin methyl ether, isatin, indigotin, indirubin** | dyer’s broom + indigo/woad       |                          |
| Church of St Stephen                                 | No. 72           | chasuble, textile from sides    | Europe, the 16th cent. ¹ | green        | **luteolin di-O-hex, luteolin 7-O-glc, apigenin 7-O-glc, luteolin O-hex (2), luteolin, apigenin, isatin, indigotin, indirubin** | weld + indigo/woad                |                          |
| Church of St Stephen                                 | No. 84           | chasuble, textile from orphrey   | Europe, the 16th cent. ¹ | green        | **luteolin di-O-hex, luteolin 7-O-glc, apigenin 7-O-glc, luteolin O-hex (2), luteolin, apigenin, isatin, indigotin, indirubin** | weld + indigo/woad                |                          |

(continued on next page)
Table 1 (continued)

| Storage location                                      | Textile number* | Object*            | Origin and dating* | Fibre colour | Identified compounds                                                                 | Original dye                      | Remarks                                      |
|-------------------------------------------------------|-----------------|--------------------|--------------------|--------------|--------------------------------------------------------------------------------------|-----------------------------------|---------------------------------------------|
| Church of St Barbara                                   | No. 91          | burse, main textile| Europe, the 17th   | green        | genistin, luteolin 7-O-glcl, luteolin 0-glcr(1), luteolin O-hex (2), O-methyl luteolin 0-glcr, luteolin, apigenin, isatin, indigotin, indirubin | sawwort + indigo/woad + traces of dyer's broom |
| Corpus Christi Basilica                               | No. 96          | chalice velum, main textile | Europe, the 17th cent. | green        | carminic acid, genistin, luteolin 7-O-glcl, genistein O-hex, luteolin O-hex (1), apigenin 7-O-glcl, luteolin O-hex (2), O-methyl luteolin 0-glcr, luteolin, genistein, luteolin methyl ether, apigenin, biochanin A, isatin, indigotin, indirubin | dyer's broom + indigo/woad |
| Basilica of Holy Trinity (Monastery Church of the Dominicans) | No. 101         | parura, lining     | Europe, the 17th cent. | green        | luteolin C-hex, genistin, luteolin 7-O-glcl, genistein O-hex, luteolin O-hex (1), apigenin 7-O-glcl, luteolin O-hex (2), luteolin, genistein, luteolin methyl ether, apigenin, diosmetin, isatin, indigotin, indirubin | dyer's broom + indigo/woad |
| Church of St Barbara                                   | No. 105         | chalice velum, main textile | Europe, the 17th cent. | green        | luteolin di-O-hex, luteolin 7-O-glcl, luteolin O-hex (1), apigenin 7-O-glcl, luteolin O-hex (2), luteolin, apigenin, isatin, indigotin | weld + indigo/woad |
| Corpus Christi Basilica                               | No. 112         | chasuble, main textile | Europe, the 17th cent. | green        | luteolin di-O-hex, genistin, luteolin 7-O-glcl, luteolin O-hex (1), apigenin 7-O-glcl, luteolin O-hex (2), luteolin, genistein, apigenin, isatin, indigotin | weld + indigo/woad |
| Church of St Stephen                                   | No. 116         | chasuble, textile from sides | Near East, the 17th cent. | green        | luteolin di-O-hex, genistin, luteolin 7-O-glcl, luteolin O-hex (1), apigenin 7-O-glcl, luteolin O-hex (2), luteolin, genistein, apigenin, isatin, indigotin | weld + dyer's broom + indigo/woad |

(continued on next page)
| Storage location                          | Textile number | Object*                      | Origin and dating* | Fibre colour | Identified compounds                                                                 | Original dye                     | Remarks                          |
|------------------------------------------|----------------|------------------------------|--------------------|--------------|--------------------------------------------------------------------------------------|----------------------------------|----------------------------------|
| Church of St Mark                        | No. 118        | chasuble, textile from sides| Europe, the 17th   | green        | luteolin di-O-hex, luteolin 7-O-glc, apigenin 7-O-glc, luteolin O-hex (2), O-methylisatin, luteolin, apigenin, diosmetin, isatin, indigotin | weld + indigo/woad               |                                  |
| Church of St Andrew (Monastery Church of | No. 120        | stole, main textile         | Near East, the 17th| green        | luteolin di-O-hex, luteolin 7-O-glc, apigenin 7-O-glc, luteolin O-hex (2), O-methylisatin, luteolin, apigenin, diosmetin, isatin, indigotin | weld + indigo/woad               |                                  |
| Poor Clares)                             |                |                              | cent.              |              |                                                                                      |                                  |                                  |
| Church of St Francis of Assisi (         | No. 127        | stole, main textile         | Europe, the 17th   | green        | luteolin di-O-hex, luteolin 7-O-glc, luteolin O-hex (1), apigenin 7-O-glc, luteolin, apigenin, diosmetin, isatin, indigotin, indirubin | weld + indigo/woad               |                                  |
| Monastery Church of the Franciscans)     |                |                              | cent.              |              |                                                                                      |                                  |                                  |
| Church of St Francis of Assisi (         | No. 128        | maniple, main textile       | Europe, the 17th   | green        | luteolin di-O-hex, luteolin 7-O-glc, luteolin O-hex (2), O-methylisatin, luteolin, apigenin, diosmetin, isatin, indigotin, indirubin | weld + indigo/woad + traces of   |                                  |
| Monastery Church of the Franciscans)     |                |                              | cent.              |              |                                                                                      | orchil                           |                                  |
| Basilica of Holy Trinity (Monastery Church of the Dominicans) | No. 130 | chasuble, around-neck-opening textile | Europe, the 17th cent. | green | genistin, luteolin 7-O-glc, genistein O-hex, luteolin O-hex (1), apigenin 7-O-glc, luteolin, genistein, luteolin methyl ether, apigenin, biochanin A, indigotin, isatin | dyer’s broom + indigo/woad       | traces of synthetic dyes          |
| Basilica of Holy Trinity (Monastery Church of the Dominicans) | No. 133 | maniple, main textile | Europe, the 17th cent. | green | luteolin di-O-hex, luteolin 7-O-glc, luteolin O-hex (1), apigenin 7-O-glc, luteolin, genistein, luteolin methyl ether, apigenin, biochanin A, indigotin, isatin | weld + indigo/woad               | traces of synthetic dyes          |
| Corpus Christi Basilica                  | No. 134        | chasuble, textile from sides on back | N/A, the 17th cent. | green | genistin, luteolin 7-O-glc, genistein O-hex, luteolin O-hex (1), apigenin 7-O-glc, luteolin, genistein, luteolin methyl ether, biochanin A, isatin, indigotin, indirubin | dyer’s broom + indigo/woad       |                                  |

(continued on next page)
| Storage location                              | Textile number* | Object*                        | Origin and dating* | Fibre colour | Identified compounds                                                                 | Original dye                                                                 | Remarks                                                                 |
|-----------------------------------------------|-----------------|--------------------------------|--------------------|--------------|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| Basilica of Holy Trinity (Monastery Church of | No. 140         | pall, main textile             | Europe, the 17th   | brown        | gallic acid, digalloyglucose, **ellagic acid**, isatin, indigotin                      | ellagitannins (of unknown origin) + traces of indigo/woad                    | dyer’s broom + indigo/woad + traces of orchil                            |
| the Dominicans)                               |                 |                                | cent. 2            |              |                                                                                       |                                                                               |                                                                          |
| Church of St Barbara                           | No. 143         | chasuble, main textile         | Europe, the 17th   | green        | **genistin, luteolin 7-O-glc**, genistein 0-hex, luteolin 0-hex (1), apigenin 7-O-gl |                                                                                   |                                                                          |
|                                               |                 |                                | cent. 2            |              | c, luteolin 0-hex (2), **O-methylglucose, luteolin, genistin, luteolin methyl ether,| dyer’s broom + indigo/woad + traces of orchil                                |
|                                               |                 |                                |                    |              | apigenin, isatin, orchi1, orchi2, **indigotin**, indirubin                           |                                                                               |                                                                          |
| Basilica of Holy Trinity (Monastery Church of | No. 145         | maniple, main textile         | Europe, the 17th   | green        | **luteolin di-C-hex, luteolin 7-C-glc**, apigenin 7-C-gl, luteolin C-hex (2), C-    | **weld or dyer’s broom + indigo/woad**                                       |                                                                          |
| the Dominicans)                               |                 |                                | cent. 2            |              | methylglucose, luteolin, **indigotin**, indirubin                                     |                                                                               |                                                                          |
|                                                |                 |                                |                    |              |                                                                                       |                                                                               |                                                                          |
| Corpus Christi Basilica                        | No. 160         | chasuble, main textile         | Europe, the 17th   | green        | **luteolin 7-O-glc**, genistein 0-hex, luteolin 0-hex (1), **apigenin 7-O-glc, lute | dyer’s broom + indigo/woad                                                  |                                                                          |
|                                                 |                 |                                | cent. 2            |              |olin 0-hex (2), **O-methylglucose, luteolin, genistein, luteolin methyl ether,        |                                                                               |                                                                          |
|                                                 |                 |                                |                    |              | apigenin, isatin, **indigotin**, indirubin                                           |                                                                               |                                                                          |
| Church of St Francis of Assisi (Monastery      | No. 161         | chalice velum, main textile    | Europe, the 17th   | green        | **luteolin 7-O-glc**, genistein 0-hex, luteolin 0-hex (1), **apigenin 7-O-glc, lute | dyer’s broom + indigo/woad                                                  |                                                                          |
| Church of the Franciscans)                    |                 |                                | cent. 2            |              |olin 0-hex (2), **O-methylglucose, luteolin, genistein, luteolin methyl ether,        |                                                                               |                                                                          |
|                                                |                 |                                |                    |              | apigenin, isatin, **indigotin**, indirubin                                           |                                                                               |                                                                          |
| Church of St Peter and St Paul                | No. 164         | cope, textile from hood        | Europe, the 17th   | green        | **carmine**, **genistin, luteolin 7-O-glc**, genistein 0-hex, luteolin 0-hex (1),   | dyer’s broom + indigo/woad + traces of synthetic dyes of cochineal (of      |
|                                                |                 |                                | cent. 2            |              | apigenin 7-O-glc, luteolin 0-hex (2), **luteolin, genistein, isatin, **indigotin,    | unknown origin)                                                              |                                                                          |
|                                               |                 |                                |                    |              | indirubin                                                                               |                                                                               |                                                                          |

*(continued on next page)*
| Storage location                                                                 | Textile number | Object*                           | Origin and dating* | Fibre colour | Identified compounds                                                                 | Original dye                                      | Remarks                                                                 |
|---------------------------------------------------------------------------------|----------------|-----------------------------------|--------------------|--------------|--------------------------------------------------------------------------------------|--------------------------------------------------|------------------------------------------------------------------------|
| Church of the Conversion of St Paul (Monastery Church of the Lazarists)         | No. 166        | cope, main textile                | Europe, the 17th cent.  | green        | chlorogenic acid, luteolin C-hex, genistin, luteolin 7-O-glc, genistein O-hex, luteolin 0-glc (1), luteolin 0-glc (2), apigenin 7-O-glc, 0-methyl luteolin O-glc, luteolin, genistein, apigenin, diosmetin, biochanin A, isatin, indigotin | dyer's broom + indigo/woad                      | presence of synthetic dye, original fibre colour – green               |
| Basilica of Holy Trinity (Monastery Church of the Dominicans)                   | No. 172        | stole, main textile               | Europe, the 17th cent.  | green        | chlorogenic acid, luteolin C-hex, luteolin 7-O-glc, luteolin 0-glc (1), luteolin 0-glc (2), apigenin 7-O-glc, 0-methyl luteolin O-glc, luteolin, genistein, apigenin, diosmetin, biochanin A, isatin, indigotin | sawwort + indigo/woad                             |                                                                        |
| Church of St Anne                                                                | No. 175        | chasuble, main textile            | Europe, the 17th cent.  | green        | chlorogenic acid, luteolin C-hex, luteolin 7-O-glc, luteolin 0-glc (1), luteolin 0-glc (2), apigenin 7-O-glc, 0-methyl luteolin O-glc, luteolin, genistein, apigenin, diosmetin, biochanin A, isatin, indigotin | weld + indigo/woad                                |                                                                        |
| Corpus Christi Basilica                                                          | No. 181        | chalice velum, main textile       | Europe, the 17th cent.  | blue         | chlorogenic acid, genistin, luteolin 7-O-glc, ellagic acid, apigenin 7-O-glc, luteolin O-hex (1), luteolin 0-hex (2), luteolin, genistein, luteolin methyl ether, apigenin | dyer's broom                                     | presence of synthetic dye, original fibre colour – yellow               |
| Church of St Joseph (Monastery Church of the Bernardine Nuns)                   | No. 188        | damask, textile fragment          | Europe, the 17th cent.  | green        | luteolin C-hex, carminic acid, genistin, luteolin 7-O-glc, luteolin 0-glc (1), luteolin 0-glc (2), 0-methyl luteolin O-glc, luteolin, genistein, isatin, indigotin, indirubin | dyer's broom + indigo/woad                       |                                                                        |
| Church of St Michael the Archangel and St Stanislaus Bishop and Martyr (Monastery Church of the Pauline Fathers) | No. 190        | chasuble, textile from sides      | Europe, the 17th cent.  | green        | chlorogenic acid, luteolin C-hex, genistin, luteolin 7-O-glc, luteolin 0-glc (1), luteolin 0-glc (2), 0-methyl luteolin O-glc, luteolin, genistein, apigenin, diosmetin, isatin, indigotin, indirubin | dyer's broom + sawwort + indigo/woad              |                                                                        |

(continued on next page)
| Storage location | Textile number | Object* | Origin and dating* | Fibre colour | Identified compounds | Original dye | Remarks |
|------------------|----------------|---------|-------------------|--------------|----------------------|--------------|---------|
| Basilica of Holy Trinity (Monastery Church of the Dominicans) | No. 191 | chasuble, textile from sides | Europe, the 17th cent. ² | green | genistin, luteolin 7-O-glc, genistein 0-hex, luteolin 0-hex (1), apigenin 7-O-glc, luteolin 0-hex (2), 0-methylluteolin 0-glcr, luteolin, genistein, luteolin methyl ether, isatin, indigotin, indirubin luteolin di-0-hex, luteolin 7-O-glc, luteolin 0-hex (1), apigenin 7-O-glc, luteolin 0-hex (2), luteolin, apigenin, diosmetin, isatin, indigotin, indirubin braz1, braz2, braz3, braz4, braz5, braz6, bixin | dyer’s broom + indigo/woad |
| Basilica of Holy Trinity (Monastery Church of the Dominicans) | No. 195 | chalice velum, main textile | Europe, the 17th cent. ² | green | luteolin di-0-hex, luteolin 7-O-glc, luteolin 0-hex (1), apigenin 7-O-glc, luteolin 0-hex (2), luteolin, apigenin, diosmetin, isatin, indigotin, indirubin braz1, braz2, braz3, braz4, braz5, braz6, bixin | weld + indigo/woad |
| Basilica of Holy Trinity (Monastery Church of the Dominicans) | No. 196 | stole, textile from the endings | Europe, the 17th cent. ² | red | brazilwood + annatto | presence of synthetic dye, original fibre colour – yellow or orange |
| Church of St Andrew (Monastery Church of the Poor Clares) | No. 198 | chalice velum, main textile | Europe, the 17th cent. ² | green | genistin, luteolin 7-O-glc, genistein 0-hex, luteolin 0-hex (1), apigenin 7-O-glc, luteolin 0-hex (2), 0-methylluteolin 0-glcr, luteolin, genistein, luteolin methyl ether, isatin, orchil1, orchil2, orchil3, indigotin genistin, luteolin 7-O-glc, genistein 0-hex, luteolin 0-hex (1), apigenin 7-O-glc, luteolin 0-hex (2), luteolin, genistein, luteolin methyl ether, apigenin, isatin, indigotin luteolin C-hex, genistin, luteolin 7-O-glc, genistein 0-hex, luteolin 0-hex (1), apigenin 7-O-glc, luteolin 0-hex (2), 0-methylluteolin 0-glcr, luteolin, genistein, luteolin methyl ether, apigenin, isatin, orchil1, orchil2, indigotin | dyer’s broom + indigo/woad + traces of orchil |
| Church of St Barbara | No. 200 | chasuble, textile from sides | Europe, the 17th cent. ² | green | genistin, luteolin 7-O-glc, genistein 0-hex, luteolin 0-hex (1), apigenin 7-O-glc, luteolin 0-hex (2), 0-methylluteolin 0-glcr, luteolin, genistein, luteolin methyl ether, isatin, orchil1, orchil2, orchil3, indigotin genistin, luteolin 7-O-glc, genistein 0-hex, luteolin 0-hex (1), apigenin 7-O-glc, luteolin 0-hex (2), luteolin, genistein, luteolin methyl ether, apigenin, isatin, indigotin luteolin C-hex, genistin, luteolin 7-O-glc, genistein 0-hex, luteolin 0-hex (1), apigenin 7-O-glc, luteolin 0-hex (2), 0-methylluteolin 0-glcr, luteolin, genistein, luteolin methyl ether, apigenin, isatin, orchil1, orchil2, indigotin | dyer’s broom + indigo/woad |
| Basilica of Holy Trinity (Monastery Church of the Dominicans) | No. 201 | chasuble, textile from orphrey and around-neck-opening textile | Europe, the 17th cent. ² | green | genistin, luteolin 7-O-glc, genistein 0-hex, luteolin 0-hex (1), apigenin 7-O-glc, luteolin 0-hex (2), 0-methylluteolin 0-glcr, luteolin, genistein, luteolin methyl ether, apigenin, isatin, orchil1, orchil2, indigotin | dyer’s broom + indigo/woad + traces of orchil |

(continued on next page)
| Storage location                                                                 | Textile number | Object*                  | Origin and dating* | Fibre colour | Identified compounds                                                                                           | Original dye                                | Remarks                                                                                           |
|--------------------------------------------------------------------------------|---------------|--------------------------|-------------------|-------------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------|------------------------------------------------------------------------------------------------|
| Church of St Francis of Assisi (Monastery Church of the Franciscans)           | No. 206       | chasuble, textile from sides | Europe, the 17th cent. | green       | luteolin di-O-hex, luteolin 7-O-gluc, luteolin 0-hex (1), apigenin 7-O-gluc, luteolin 0-hex (2), luteolin, apigenin, Diosmetin, isatin, orchil1, orchil2, Indigotin, indirubin | weld + indigo/woad + traces of orchil     |                                                                                        |
| Church of St Francis of Assisi (Monastery Church of the Franciscans)           | No. 208       | chasuble, textile on back sides and insert in front orphrey | Europe, the 17th cent. | yellow      | braz1, braz2, braz3, braz4, braz5, braz6, sulfuretin                                                        | brazilwood + young fustic                   |                                                                                        |
| Church of St Barbara                                                          | No. 208       | chasuble, textile from sides | Europe, the 17th cent. | orange      | braz1, braz2, braz3, braz4, carminic acid, genistin, braz5, luteolin 7-O-gluc, genistein, biochanin A | brazilwood + dyer’s broom                   |                                                                                        |
| Church of St Peter and St Paul                                               | No. 223       | stole, main textile       | Europe, the 17th cent. | red         | carminic acid, genistin, luteolin 7-O-gluc, genistein 0-hex, luteolin 0-hex (1), apigenin 7-O-gluc, luteolin 0-hex (2), 0-methyl-luteolin 0-glcr, luteolin, genistein, luteolin methyl ether, isatin, indigotin | dye’s broom + indigo/woad                  | presence of synthetic dye, original fibre colour – green |
| Church of St Peter and St Paul                                               | No. 224       | chasuble, main textile    | Europe, the 17th cent. | yellow      | luteolin 7-O-gluc, genistein 0-hex, luteolin 0-hex (1), apigenin 7-O-gluc, luteolin 0-hex (2), luteolin, genistein, isatin, indigotin, indirubin | dye’s broom + indigo/woad                  |                                                                                        |
| Church of St Anne                                                            | No. 227       | chasuble, textile from sides | Europe, the 17th cent. | green       | genistin, luteolin 7-O-gluc, genistein 0-hex, Tuteolin 0-hex (2), apigenin 7-O-gluc, luteolin 0-hex (1), luteolin, genistein, isatin, indigotin, indirubin | dye’s broom + indigo/woad                  |                                                                                        |
| Basilica of Holy Trinity (Monastery Church of the Dominicans)                | No. 231       | chasuble, main textile    | Europe, the 17th cent. | yellow      | genistin, luteolin 7-O-gluc, genistein 0-hex, Tuteolin 0-hex (2), apigenin 7-O-gluc, luteolin 0-hex (1), luteolin, genistein, isatin, indigotin, indirubin | dye’s broom + young fustic                 |                                                                                        |

(continued on next page)
| Storage location                                      | Textile number* | Object*                     | Origin and dating* | Fibre colour | Identified compounds                                                                 | Original dye               | Remarks                                      |
|------------------------------------------------------|-----------------|-----------------------------|--------------------|--------------|-------------------------------------------------------------------------------------|----------------------------|----------------------------------------------|
| Basilica of Holy Trinity (Monastery Church of the Dominicans) | No. 231         | maniple, main textile       | Europe, the 17th cent. | yellow       | genistin, luteolin 7-O-glc, genistein O-hex, luteolin O-hex (1), apigenin 7-O-glc, luteolin O-hex (2), O-methyluteolin O-glcr, sulfuretin, luteolin, genistein, luteolin methyl ether, bixin | dyer’s                    | broom + annatto + young fustic             |
| Basilica of Holy Trinity (Monastery Church of the Dominicans) | No. 232         | chalice velum, main textile | Europe, the 17th cent. | yellow       | genistin, luteolin 7-O-glc, genistein O-hex, luteolin O-hex (1), apigenin 7-O-glc, luteolin O-hex (2), O-methyluteolin O-glcr, sulfuretin, luteolin, genistein, luteolin methyl ether | dyer’s                    | broom + traces of young fustic             |
| Church of St Andrew (Monastery Church of the Poor Clares) | No. 245         | chasuble, main textile      | Europe, the 17th cent. | green        | luteolin di-O-hex, luteolin 7-O-glc, apigenin 7-O-glc, luteolin O-hex (2), O-methyluteolin O-glcr, luteolin, apigenin, diosmetin, isatin, indigotin, indirubin | weld + indigo/woad         | dyer’s broom + indigo/woad                 |
| Church of St Mark                                    | No. 249         | chasuble, textile from sides| Europe, the 17th cent. | green        | luteolin di-O-hex, luteolin 7-O-glc, apigenin 7-O-glc, luteolin O-hex (2), O-methyluteolin O-glcr, luteolin, apigenin, diosmetin, isatin, indigotin, indirubin | weld + indigo/woad         | dyer’s broom + indigo/woad                 |
| Basilica of Holy Trinity (Monastery Church of the Dominicans) | No. 250         | stole, main textile         | Europe, the 17th cent. | yellow       | luteolin di-O-hex, luteolin 7-O-glc, apigenin 7-O-glc, luteolin O-hex (2), luteolin, apigenin, diosmetin, isatin, indigotin, indirubin | weld                      | dyer’s                                      |
| Basilica of Holy Trinity (Monastery Church of the Dominicans) | No. 260         | stole, main textile         | Europe, the 17th cent. | yellow       | luteolin C-hex, carminic acid, genistin, luteolin 7-O-glc, genistein O-hex, luteolin O-hex (1), apigenin 7-O-glc, luteolin O-hex (2), luteolin, genistein, apigenin, diosmetin, isatin, indigotin, indirubin | young fustic              | traces of synthetic dye                     |
| Church of St Peter and St Paul                       | No. 269         | stole, silk main textile    | Europe, the 17th cent. | green        | luteolin C-hex, carminic acid, genistin, luteolin 7-O-glc, genistein O-hex, luteolin O-hex (1), apigenin 7-O-glc, luteolin O-hex (2), luteolin, genistein, apigenin, diosmetin, isatin, indigotin, indirubin | dyer’s                    | broom + indigo/woad                         |

(continued on next page)
| Storage location | Textile number | Object* | Origin and dating* | Fibre colour | Identified compounds | Original dye | Remarks |
|------------------|---------------|---------|-------------------|-------------|---------------------|-------------|---------|
| Church of St Anne | No. 271 | maniple, main textile | Europe, the 17th cent. | orange | braz1, braz2, braz3, braz4, braz5, braz6, bixin genistin, luteolin 7-O-glcr, apigenin 7-O-glcr, luteolin 0-hex (2), O-methylleuteolin 0-glcr, luteolin genistein, apigenin, isatin, indigotin genistin, luteolin 7-O-glcr, luteolin 0-hex (1), apigenin 7-O-glcr, luteolin 0-hex (2), O-methylleuteolin 0-glcr, luteolin genistein, luteolin, apigenin, isatin, indigotin genistin, luteolin 7-O-glcr, genistein 0-hex, luteolin 0-hex (1), apigenin 7-O-glcr, luteolin 0-hex (2), O-methylleuteolin 0-glcr, luteolin genistein, luteolin methyl ether, apigenin, isatin, indigotin luteolin 7-O-glcr, luteolin 0-glcr (1), luteolin 0-glcr (2), O-methylleuteolin 0-glcr, luteolin, genistein, luteolin methyl ether, apigenin, isatin, indigotin luteolin 7-O-glcr, luteolin 0-glcr (1), luteolin 0-glcr (2), O-methylleuteolin 0-glcr, luteolin genistein, luteolin, apigenin, isatin, indigotin | brazilwood + annatto | dyer’s |
| Church of the Visitation of the Blessed Virgin Mary (Monastery Church of the Carmelites) | No. 287 | chasuble, textile from orphrey | N/A, c. 1700 | green | sawwort + indigo/woad | | |
| Church of the Assumption of the Holy Mother and St Venceslaus (Monastery Church of the Cistercians) | No. 288 | chasuble, orphrey and around-neck-opening textile | Europe, the 17th cent. | green | sawwort + indigo/woad | | |
| Church of St Francis of Assisi (Monastery Church of the Franciscans) | No. 292 | chasuble, main textile | Europe, the 17th cent. | green | sawwort + indigo/woad | | |
| Church of the Conversion of St Paul (Monastery Church of the Lazarists) | No. 293 | stole, main textile | Europe, the 17th cent. | green | sawwort + indigo/woad | | |
| Church of St Michael the Archangel and St Stanislaus Bishop and Martyr (Monastery Church of the Pauline Fathers) | No. 298 | chasuble, textile from sides | Near East, the 15th cent. | green | sawwort + indigo/woad + traces of orchil | | |
| Church of St Francis of Assisi (Monastery Church of the Franciscans) | No. 299 | stole, main textile | Near East, the 16th cent. | green | unknown yellow flavonoid dye II + bastard hemp (unknown yellow flavonoid dye III) + indigo/woad + traces of madder (of unknown origin) | | |
| Storage location | Textile number* | Object* | Origin and dating* | Fibre colour | Identified compounds | Original dye | Remarks |
|------------------|----------------|---------|--------------------|--------------|---------------------|-------------|---------|
| Church of St Francis of Assisi (Monastery Church of the Franciscans) | No. 299 | chasuble, textile from sides | Near East, the 16th cent. | green | *rutin, hyperoside, luteolin 7-O-glc, kaempferol 0-hex-dhex, kaempferol 3-O-glc, unknown (577), luteolin, datiscetin, unknown (621), unknown (591), biochanin A, unknown (299), madder2, madder3, isatin, indigotin, indirubin | unknown yellow flavonoid dye | II + bastard hemp (unknown yellow flavonoid dye III) + indigo/woad + traces of madder (of unknown origin) weld + indigo/woad |
| Church of St Francis of Assisi (Monastery Church of the Franciscans) | No. 317 | chasuble, orphrey and around-neck-opening textile | Near East, the 17th cent. | green | *luteolin di-o-hex, luteolin 7-O-glc, luteolin 0-hex (1), apigenin 7-O-glc, luteolin 0-hex (2), O-methylisoluteolin O-glcr, luteolin, apigenin, diosmetin, acacetin, isatin, indigotin, indirubin luteolin C-hex, rutin, hyperoside, luteolin 7-O-glcr, kaempferol 0-hex-dhex, kaempferol 3-O-glc, ellagic acid, unknown (577), luteolin, datiscetin, unknown (621), unknown (591), biochanin A, unknown (299), isatin, indigotin, indirubin | unknown yellow flavonoid dye | II + bastard hemp (unknown yellow flavonoid dye III) + indigo/woad |
| Church of the Assumption of the Blessed Virgin Mary (Monastery Church of the Camaldolese Monks) | No. 320 | stole, main textile | Near East, the 17th cent. | green | luteolin di-o-hex, luteolin 7-O-glcr, luteolin 0-hex (1), apigenin 7-O-glcr, luteolin 0-hex (2), O-methylisoluteolin O-glcr, luteolin, apigenin, diosmetin, isatin, indigotin | weld + indigo/woad |
| Church of the Annunciation to the Blessed Virgin Mary (Monastery Church of the Capuchins) | No. 321 | chasuble, textile from front sides | Near East, the 17th cent. | green | luteolin di-o-hex, luteolin 7-O-glcr, luteolin 0-hex (1), apigenin 7-O-glcr, luteolin 0-hex (2), O-methylisoluteolin O-glcr, luteolin, apigenin, diosmetin, isatin, indigotin | weld + indigo/woad |
| Church of St Anne | No. 322 | burse, main textile | Near East, the 17th cent. | green | luteolin di-o-hex, luteolin 7-O-glcr, luteolin 0-hex (1), apigenin 7-O-glcr, luteolin 0-hex (2), O-methylisoluteolin O-glcr, luteolin, apigenin, diosmetin, isatin, indigotin | weld + indigo/woad |
| Baslica of Holy Trinity (Monastery Church of the Dominicans) | No. 326 | chalice velum, main textile | Near East, the 17th cent. | green | *luteolin di-o-hex, luteolin 7-O-glcr, luteolin 0-hex (1), apigenin 7-O-glcr, luteolin 0-hex (2), luteolin, apigenin, diosmetin, isatin, indigotin | Persian berries + indigo/woad |

(continued on next page)
Table 1 (continued)

| Storage location                                                                 | Textile number* | Object* | Origin and dating* | Fibre colour | Identified compounds                                                                                                                                                                                                 | Original dye                          | Remarks                                      |
|----------------------------------------------------------------------------------|-----------------|---------|--------------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|---------------------------------------------|
| Church of the Annunciation to the Blessed Virgin Mary (Monastery Church of the Capuchins) | No. 327         | chalice velum, main textile | Near East, the 17th cent. | greenish blue | rutin, luteolin/kaempferol 0-hex-dhex-dhex, kaempferol 0-hex-dhex, apigenin 7-O-glc, rhamnocitrin 0-(hex-dhex-dhex), luteolin, biochanin A, biochanin A, rhamnocitrin, **emodin**, isatin, **indigotin**, indirubin | Persian berries + indigo/woad           |                                             |
| Church of the Visitation of the Blessed Virgin Mary (Monastery Church of the Carmelites) | No. 328         | chasuble, main textile       | Near East, the 17th cent. | green        | **rutin**, hyperoside, luteolin/kaempferol 0-hex-dhex-dhex, kaempferol 0-hex-dhex, quercitrin, apigenin 7-O-glc, **rhamnocitrin** 0-(hex-dhex-dhex), luteolin, biochanin A, rhamnocitrin, **emodin**, isatin, **indigotin** | Persian berries + indigo/woad          | traces of synthetic dyes                   |
| Church of St Barbara                                                              | No. 329         | chasuble, main textile       | Near East, the 17th cent. | green        | chlorogenic acid, rutin, **hyperoside**, luteolin 7-O-glc, **kaempferol** 3-O-glc, **isorhamnetin** 3-O-glc, isatin, **indigotin**, indirubin | larkspur (unknown yellow flavonoid dye) | I) + indigo/woad                           |
| Basilica of Holy Trinity (Monastery Church of the Dominicans)                    | No. 330         | parura, main textile         | Near East, the 17th cent. | green        | chlorogenic acid, rutin, **hyperoside**, luteolin 7-O-glc, **kaempferol** 3-O-glc, **isorhamnetin** 3-O-glc, isatin, **indigotin** | larkspur (unknown yellow flavonoid dye) | I) + indigo/woad                           |
| Basilica of Holy Trinity (Monastery Church of the Dominicans)                    | No. 332         | chalice velum, main textile  | Near East, the 17th cent. | green        | chlorogenic acid, rutin, **hyperoside**, luteolin 7-O-glc, **kaempferol** 3-O-glc, **isorhamnetin** 3-O-glc, isatin, **indigotin** | larkspur (unknown yellow flavonoid dye) | I) + indigo/woad                           |
| Basilica of Holy Trinity (Monastery Church of the Dominicans)                    | N/A (D-31#)     | maniple, main textile        | Europe, the 17th cent.    | green        | luteolin 7-O-glc, **luteolin** 7-O-glc, **luteolin** 0-glc1, 0-methyl-luteolin 0-glcr, **luteolin**, isatin, **indigotin** | larkspur (unknown yellow flavonoid dye) | I) + indigo/woad                           |
| Church of St Francis of Assisi (Monastery Church of the Franciscans)              | N/A (F-11/3#)   | chasuble, around-neck-opening textile | N/A                     | yellow       | **brazil1**, braz2, **braz3**, braz4, **braz5**, braz6, isatin, indigotin, **bixin** | brazilwood + annatto                      |                                             |

(continued on next page)
| Storage location | Textile number | Object* | Origin and dating* | Fibre colour | Identified compounds | Original dye | Remarks |
|------------------|----------------|---------|--------------------|--------------|----------------------|--------------|---------|
| Church of St Francis of Assisi (Monastery Church of the Franciscans) | N/A (F-14/2*) | chasuble, textile from sides | Europe, the 17th cent. | green | luteolin di-O-hex, luteolin 7-O-glc, apigenin 7-O-glc, luteolin O-hex (2), luteolin, apigenin, diosmetin, isatin, indigotin, indirubin genistin, luteolin 7-O-glc, genistein O-hex, luteolin O-hex (1), apigenin 7-O-glc, luteolin 0-hex (2), O-methyluteolin O-glc, luteolin, genistein, luteolin methyl ether, isatin, indigotin, indirubin luteolin di-O-hex, luteolin 7-O-glc, luteolin O-hex (1), apigenin 7-O-glc, O-methyluteolin O-glc, luteolin, apigenin, diosmetin, isatin, indigotin, indirubin luteolin C-hex, genistin, luteolin 7-O-glc, luteolin O-hex (1), apigenin 7-O-glc, O-methyluteolin O-glc, luteolin, genistein, apigenin, diosmetin, isatin, indigotin, indirubin luteolin di-O-hex, luteolin 7-O-glc, luteolin O-hex (1), luteolin O-hex (2), O-methyluteolin O-glc, luteolin, genistein, luteolin methyl ether, apigenin, diosmetin, isatin, indigotin, indirubin luteolin di-O-hex, luteolin 7-O-glc, luteolin O-hex (2), O-methyluteolin O-glc, luteolin, apigenin, diosmetin, isatin, ochil1, ochil2, ochil3, ochil4, indigotin, indirubin | weld + indigo/woad | |
| Church of St Francis of Assisi (Monastery Church of the Franciscans) | N/A (F-15/1*) | chasuble, textile from sides | Europe, the 17th cent. | green | dyer's broom + indigo/woad |
| Church of St Francis of Assisi (Monastery Church of the Franciscans) | N/A (F-20/3*) | stole, main textile | Europe, the 16th-17th cent. | green | weld + indigo/woad |
| Corpus Christi Basilica | N/A (KBC-11/2*) | stole, lining | Europe, the 17th cent. | yellowish green | dyer's broom + indigo/woad |
| Corpus Christi Basilica | N/A (KBC-18*) | stole, main textile | N/A | green | dyer's broom + sawwort + indigo/woad |
| Church of the Visitation of the Blessed Virgin Mary (Monastery Church of the Carmelites) | N/A (KnP-8*) | chasuble, main textile | N/A | green | weld + indigo/woad + traces of ochil |

(continued on next page)
Table 1 (continued)

| Storage location | Textile number* | Object* | Origin and dating* | Fibre colour | Identified compounds | Original dye | Remarks |
|------------------|-----------------|---------|--------------------|--------------|----------------------|--------------|---------|
| Church of the Conversion of St Paul (Monastery Church of the Lazarists) | N/A (M-7#) | chalice velum, main textile | Near East, the 17th cent. | violet carminic acid, luteolin di-O-hex, braz5, luteolin 7-O-glc, luteolin O-glcr (1), luteolin 0-glcr(2), sulfuretin, luteolin, apigenin | brazilwood + weld + young fustic + traces of cochineal (of unknown origin) | presence of synthetic dye, original fibre colour – yellow or orange |

* detailed data presented in “KATALOG TKANIN z zasobów kościelnych Krakowa z czasów od XV do końca XVII” (in Polish), Natalia Krupa (ed.), Kraków (in printing); textile origin and dating have been established by: 1 N. Krupa, 2 A. Warzecha, 3 K. Moskal, 4 B. Biedrońska-Słota

* initial inventory number of the object
2. Experimental Design, Materials, and Methods

The 89 silk fibres (yellow, orange, brown and green) were taken from 15th- to 17th-century silk textiles used in vestments belonging to the collections of seventeen Krakow churches (all samples are listed in Table 1).

Brown and green fibres were extracted twice, using two extraction methods consecutively, the first one with dimethylsulfoxide (DMSO), and the second one with acidic-methanol extractant. Yellow and orange fibres were extracted only with the second procedure. Extraction procedure have been described in detail by Lech [1].

Separation of the colorants was carried out using a 1220 Infinity II LC Systems (Agilent Technologies, USA), whereas their identification was achieved with two spectrophotometric detectors, a 1220 Compact Variable Wavelength Detector (Agilent Technologies, Germany) and a 1200 Variable Wavelength Detector (Agilent Technologies, Germany), as well as with a 6460 Triple Quadr tandem mass spectrometric detector with electrospray ionization Jet Stream ion source (Agilent Technologies, USA). Analytes were separated by a Zorbax SB-Phenyl rapid resolution column (4.6 × 150 mm, 3.5 μm, 80 Å, Agilent Technologies) protected by a Zorbax SB-Phenyl precolumn (4.6 × 12.5 mm, 5.0 μm, Agilent Technologies). Spectrophotometric detection was performed at various wavelengths depending on the analyzed dye (280, 400, 450, 480, 500, 550, 580 or 600 nm). Mass spectrometric data were acquired in dynamic multiple reaction monitoring (dMRM) modes of negative and positive ions. Parameters of the method were described by Lech [1]. The analyses were controlled and processed by a MassHunter Workstation software (Agilent Technologies, USA).

Declaration of Competing Interest

The author declares that she has no known competing financial interests or personal relationships which have, or could be perceived to have, influenced the work reported in this article.

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References

[1] K. Lech, Universal analytical method for characterization of yellow and related natural dyes in liturgical vestments from Krakow, J. Cult. Herit. (in press)
[2] K. Lech, Natural dyes in yellow, orange, brown and green fibres, Mendeley Data, v1, 2020. https://doi.org/10.17632/w24kygn7p8.1.