



Collecting botanical sources: Joint research on organic pigments and dyestuffs

Selected dye plants

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Research into natural dyes and organic pigments used in works of art and/or objects of cultural heritage is done within the 'Development of Innovative Methodologies for Laboratory Research' task of the CHARISMA project. A better knowledge of these materials will help to improve the understanding of these works and also assist considerably in their conservation. We aim to create new, relevant information suitable for a better development of art technological research and conservation practices in ancient and in contemporary art.

For this joint research we are concentrating on two groups of dye plants which have been widely used in Europe since ancient times, growing wild or cultivated. The two groups consist of dye plants rich in red anthraquinone components, like madder, and those rich in yellow flavonoids, such as weld.

Each group contains plants with a rather similar dyestuff profile, which could be sometimes confusing for the analyst.

It is known that the organic colorants in plants may be affected by environmental factors, so we collected specimens from as wide an area across Europe as possible to determine the significance of their geographical origin. It is important that the investigated specimens are identified correctly taxonomically, thus we asked botanical gardens and nursery gardens for their help. The plants that we are studying are shown (right) with its botanical illustration.



Reseda luteola L.
(Weld)



Serratula tinctoria L.
(Saw-wort)



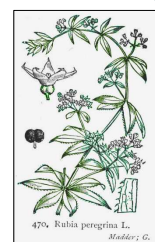
Genista tinctoria L.
(Dyer's broom)



Rubia tinctorum L.
(Madder)



Galium mollugo L.
(Hedge bedstraw)



Rubia peregrina L.
(Wild madder)



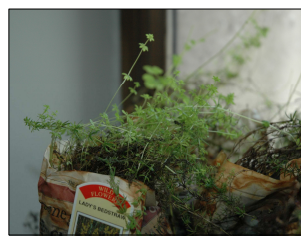
Galium verum L.
(Lady's bedstraw)

Collection of botanical sources



Provenance of plants collected

The selected plants come from sixty-one places around Europe. All sixty-one plant sources will be analysed in the first phase of this task, an extra amount of fifteen are expected for next flowering season. The map of Europe (left) shows the geographical distribution of the botanical gardens and nursery gardens involved in this project, representing the different climates as semi arid, subtropical, humid continental, humid oceanic and highlands in which these plants grow, with exception of tundra and subarctic. As much as possible information on each plant was gathered. Before analysis, the collected specimens were air-dried if possible; otherwise they were dried in an oven at 40°C.



Lady's bedstraw, Arne Herbs Nursery, Blagdon, Somerset



Ivo van Capel collecting madder root
Botanical garden Utrecht



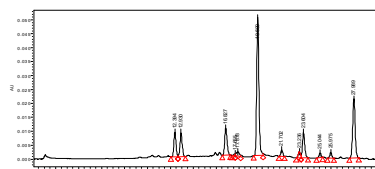
Lady's bedstraw at the
Royal Botanic Gardens, Kew

Extraction protocols

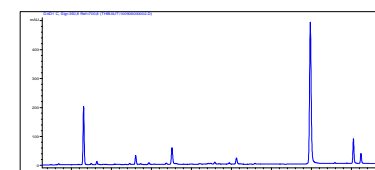
For the research analyses carried out by the participating institutions, two standard extraction protocols were developed, one for anthraquinone plants and one for flavonoid dye plants. Several extraction methods were tested in which time and temperature of extraction and addition of anti-precipitation solvent were varied. The extraction protocols were tested and gave satisfactory reproducibility standard deviations. The selected plants will now be analysed at a qualitative and quantitative level using high performance liquid chromatography (HPLC). The collected species from different sources are being divided and analysed within this joint research activity. These standard extraction protocols will be available online at www.organic-colorants.org. The results sought within this task is not only an accurate identification method for these dye plants but synergy with the European partners and also dissemination of the new knowledge created on this subject.

Collaborating partners:

- 1 - Netherlands Institute for Cultural Heritage (ICN), Netherlands
- 2 - The National Gallery (NGL), United Kingdom
- 3 - Institut Royal du Patrimoine Artistique (IRPA), Belgium
- 4 - Ormylia Foundation - Art Diagnosis Centre (Of-ADC), Greece
- 5 - The British Museum (BM), United Kingdom
- 6 - Università degli Studi di Perugia (UNIPG), Italy
- 7 - Doerner Institute, Bayerische Staatsgemäldesammlungen (DI-BS), Germany
- 8 - Istituto for the Conservation and Promotion of Cultural Heritage (ICVBC-CNR), Italy



Madder chromatogram by KIK/IRPA



Weld chromatogram by the British Museum



Pictures of a few standard extraction
Procedure steps.