DEMONSTRATION OF NEW NATURAL DYES FROM ALGAE AS SUBSTITUTION OF SYNTHETIC DYES ACTUALLY USED BY TEXTILE INDUSTRIES

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Extended abstract
SEACOLORS’ main aim is the demonstration and validation of obtaining natural dyes from a sustainable and renewable source, algae, and their application in textile industry to replace synthetic dyes which are pollutant and harmful for the environment. With this improvement, less contaminated waste water will be obtained thanks to the higher biodegradability of natural dyes, reducing the water purification process, contributing to the application of the policies and community legislation regarding waste waters – specifically, the normative 2008/105/CE on environment quality in the field of water policy which sets the maximum allowable priority substances and other chemical contaminants and also in particular the REACH regulation.

Specific objectives
• Study and selection of algae with dyeing capacity (BEA+AlgaPlus)
  The selected strains to be worked with are presented in the following table (Table 1).
**Table 1.** Strains of algae of interest

<table>
<thead>
<tr>
<th>Type</th>
<th>Algae strain</th>
<th>Main pigment</th>
<th>Genus(algae)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Macro algae</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Ulva lactuca</em></td>
<td>Carotenoids</td>
<td>Green</td>
</tr>
<tr>
<td></td>
<td><em>Gracilaria vermiculophylla</em></td>
<td>Phycoerythrin</td>
<td>Red</td>
</tr>
<tr>
<td></td>
<td><em>Phorphyra sp.</em></td>
<td>Phycoerythrin</td>
<td>Red</td>
</tr>
<tr>
<td></td>
<td><em>Hypnea spinella</em></td>
<td>Phycoerythrin</td>
<td>Red</td>
</tr>
<tr>
<td></td>
<td><em>Hydropuntia sp.</em></td>
<td>Phycoerythrin</td>
<td>Red</td>
</tr>
<tr>
<td><strong>Microalgae</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Cystoseira sp.</em></td>
<td>Carotenoids</td>
<td>Brown</td>
</tr>
<tr>
<td></td>
<td><em>Athrospira Platensis</em></td>
<td>Phycocyanin</td>
<td>Blue-green</td>
</tr>
<tr>
<td></td>
<td><em>Nostoc sp.</em></td>
<td>Phycoerythrin</td>
<td>Blue-green</td>
</tr>
<tr>
<td></td>
<td><em>Synecoccocus sp.</em></td>
<td>Phycoerythrin</td>
<td>Blue-green</td>
</tr>
</tbody>
</table>

Extracted pigments (Figure 1) which were used in the experiments are presented in the following figure.

**Figure 1.** Pigment extracts

- Production of the selected algae (BEA+Alga Plus)
- Extraction of dyes from algae (BEA+Alga Plus)
- Extracted pigment characterization (AITEX)
- Validation and demonstration of the application of algae dyes in textile dyeing process (AITEX)

**Experimental**

In this study only results obtained with red and blue pigments are presented, which are defined in the Figure 2 below.
Results and discussions

Dyeing process.

As the tests showed, cotton fabric could not be dyed at high temperatures, due to the denaturalization of the 'protein-pigments'. Thus a stabilizer was added in order to increase the process temperature and obtain better results.

In the following images are presented the dyeing conditions before and during the usage of the protein stabilizer.
**Conclusions**

Employing naturally sourced dyes represents a sustainable approach from the environmental point of view.

The blue and red pigments extracts show good dyeing results, as proved by fastness tests. This proves that they represent viable commercial dyestuff to be employed by the textile industry.

The studies are still in development regarding the increase of process temperature and dyeing intensity.

**Consortium**

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**References**
