Textiles from seabased materials

Aim and objectives

The aim of the project was to identify materials from sea and lakes in Sweden that can be used for textile applications. Biomass from sea-based raw materials can be an important option to replace fossil raw materials and complement traditional land based materials such as cotton.

Within the project, we examined options for an economic and sustainable production system for large-scale production of textile fibres and other materials from components such as proteins or polysaccharides/cellulose. In the long term, using locally produced sea-based raw materials has a large potential for Sweden to contribute to sustainable development.

Method and participating organizations

The project was carried out by researchers at the institute SWEREA IVF, with expertise in textile processes and sustainability assessment, together with senior managers from IKEA involved with materials procurement and technology search. With this constellation, we opened a broad search for material options with a focus on textile applications. The project was started based on literature and patent search to address the following questions:

- Which activities are undertaken currently to use, grow and harvest algae, and how are algal raw materials used to produce textiles and fibres?
- Which novel fibres are produced from land-based biomass, and could algae be an alternative raw material?
- What are environmental benefits and drawbacks for these new developments?

To deepen the knowledge acquired during the search, experts on algae research and application were contacted and participated in a workshop where we presented and discussed key findings. This also helped to establish a network with partners who can cover the entire chain from growing and harvesting algae to producing textiles with a high market potential.

Results

Algae show a large variety of properties depending on the species, but the composition can also be designed within limits by providing appropriate growing conditions and nutrients. Two approaches have been identified as the most promising as of today. Bio - based polyester material, PLA, is currently produced with starch from maize. Alginate is an interesting option to avoid some of the known drawbacks from land-use and competition with food. Suitable algae with high polysaccharide content that grow in cold climates include kelp and Ulva (sea lettuce). For some of them, growing and harvesting facilities are already available on a small scale. Cladophora, responsible for algal blooms and often seen as a nuisance, contains cellulose which can potentially be used to produce high-performance fibres. For this species, no commercial growing and harvesting is currently available.

Future potential

The project partners agreed to continue exploring the two main options found during the project, polysaccharide components from algae for synthetic fibres to replace polyester and high performance cellulose from Cladophora. Both paths are at an early stage and need more research for a future commercialization. Together with partners identified during the project, we aim to establish applied research for this understudied area.