

# Printing with Sustainable Natural Dyes and Pigments



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**Abstract** Natural dyes and pigments could be obtained from insects, plants, and animals. Natural dyes have been utilized in the dyeing of wool, cotton, and silk since the prehistoric ages. The first applications of natural dyes on textile fibers are estimated to have started in Mesopotamia and India in 4000 BC. In these first dyeing trials, it is thought that pigments were used for dyeing process and these pigments could be easily removed from fabrics by friction and washing because of their weak mechanical bonding onto the fibers, and therefore, dyeing process was not really successful. It is thought that mordant dyeing method may have been accidentally discovered. In many countries, such as India, Egypt, Anatolia, and China, many historical natural dyed fabrics were found. One of the first synthetic dyes, mauveine (also known as aniline purple), was accidentally synthesized by W.H. Perkin (at the age of 18) in 1856 during attempts to make quinine. The discovery of the first synthetic dye changed the natural dyeing habits and synthetic dyes replaced almost all natural dyes. However, it is known that the wastewater produced in the production steps of synthetic dyes and the chemicals used in the textile dyeing process can have toxic and pollutant effects on human and environmental health. Nowadays, the effects of environmental awareness, organic products, and the tendency toward healthy lifestyle also reflect on the textile sector. Disagreements on the risks of the usage of synthetic dyestuffs and increasing environmental awareness result in an enhanced interest in natural resources, environmentally friendly products, and new strategies. That is one of the reasons why the use of natural dyes came back to the agenda due to an increased ecological and sustainable awareness. Unlike non-renewable raw materials of synthetic dyes, natural dyes are mostly renewable and sustainable. Natural dye sources are agriculturally renewable sustainable vegetable-plant-based colorant sources. In terms of sustainability, synthetic dyes are produced from non-renewable resources; however, natural dyes are extracted from renewable sources. The ability to obtain the dye from renewable natural sources

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makes natural dyes an attractive dye class for more sustainable world. Natural dyes can be applied on the fibers not only with dyeing method but also with printing method. Textile printing is one of the most important and versatile methods among the methods used to design and colorize textile fabrics. Ancient men and women mixed the colorants such as coal or soil paint with oils and used them with their fingers in lines on various materials. The staining of the plant extracts and fabrics has provided different approaches. The patterns can be produced by the wax applications to provide resistant dye liquor, or the surrounding areas provide a tightly attached and reserved area. The word of print is referred to a process that uses pressure to impart colorant to the material. And there is no doubt that the first textile printing was occurred by the blocks with embossed printing surfaces, then these blocks were inked and printed on the fabric. Some of the first blocks were made of clay or terracotta, while others were made of carved wood. In this chapter, the information about various eco-friendly prints and different printing techniques which were applied to different kinds of fibers and fabrics using sustainable natural dyes and natural pigments are given in detail.

**Keywords** Sustainable · Printing · Natural dye · Pigment · Natural printing · Sustainability

## 1 Introduction

Printing is generally a coloring technique that can be applied on many natural and man-made fibers. In the printing process, the dyestuff usually added to the printing paste is transferred to the fabric surface by various methods (block, rotation, stencil, etc.) and the fabrics pass to the fixing stage. After the fixation process, printed fabrics are generally washed, and unfixated dyestuffs are removed. The type of dyestuff varies according to the type of fiber and the printing technique differs accordingly. The printing paste, technical and fixing conditions used are important for proper and successful printing. In the printing process, natural products can be used when preparing the printing paste. In addition, natural dyes were used in the printing process before the synthetic dyes were invented.

In ancient times, ancient civilizations had used natural dyes to colorize their clothes. They printed their clothes by using wooden blocks. In the block printing method, making wooden blocks were very hard and needed special talent and handcraft. Reserved printing is another ancient printing technique. In this method, some parts of the fabric reserved with wax or wax like materials and then dyed with natural dyes. Over thousands of years, civilizations used these methods for printing their garments. Industrial revolution affected ancient printing methods as it affected many sectors. After industrial revolution, firstly, blocks were integrated to the machines and first block printing machines were invented.