

Natural dyes are considered eco-friendly because they are renewable and biodegradable.[11] These industries' dye-bearing effluents are distinguished by their rich color, organic content, and potential hazard. The use of non-allergic, non-toxic, and eco-friendly natural dyes on textiles has become a matter of significant importance due to the increased environmental awareness to avoid some hazardous synthetic dyes.[5] Dyes are vital substances that provide substrate color in a variety of industries, including food, printing, textiles, and cosmetics. Furthermore, the design of novel dyes has always required a thorough understanding of the links between color and constitution; this is possibly the most significant early contribution to the science of color, known as the chromophore and auxochromes.[10] Typically, the theory based on the chromophore principle is an electron-withdrawing group. Typically, auxochromes are groups that release electrons and are connected by a conjugated structure. Naturally occurring yellow dyes are environmentally benign for instance, indigo provides a cooling effect, while turmeric, the brightest of these naturally occurring yellow dyes, is a potent antibacterial that revitalizes the skin.[4] Since prehistoric times natural dyes have been used for the coloring of food substrate, leather as well as fibers like wool, silk, and cotton. The chromophore and auxochrome theory is put out as a straightforward approach to understanding how color originates in dye molecules according to this definition, the carbonyl ($C=O$), diazo ($-N=N-$). Other groups, such as hydroxyl (OH) and amino (NR_2) groups, intensify the color and cause the absorption to shift to longer light wavelengths. These developments paved the way for the Middle Ages' thriving textile industries and the eventual rise of an international dye market.[8] The textile, printing, rubber, cosmetics, plastic, and leather industries all employ dyes, which are colored chemicals, to color their goods. The oldest societies used materials derived from plants, minerals, and even animals to lend color to textiles while also meeting practical needs and expressing cultural symbolism.[12]