CHAPTER 1

INTRODUCTION

Environmental issues are at the top of the international agenda. This may be related to air, water, soil, and noise pollution. The world has to take all possible steps to curb the pollution and need to work together. Despite many environmental regulations by Environmental and Ecological Legislations, the nature of materials and processes makes it nearly impossible to stop the pollution completely.

Water pollution is a primary concern among all types of pollution. The textile processing industry requires several chemicals and dyes, which creates pollution. Natural dyes were used in the dyeing of textiles until the first synthetic dye, 'Mauveine,' was invented in 1856.

Textile materials (natural and synthetic) used to be colored for value addition, look, and the desire of the customers. Anciently, this purpose of coloring textiles was initiated using colors from natural sources until synthetic colors and dyes were invented and commercialized. Due to the readily available pure synthetic dyes of different classes and their cost advantages, most textile dyers and manufacturers shifted towards using artificial colorants. Almost all the synthetic colorants synthesized from petrochemical sources through hazardous chemical processes threaten their eco-friendliness. Hence, worldwide, growing consciousness about the organic value of eco-friendly products has generated renewed interest among consumers in using textiles (preferably natural fiber products) dyed with eco-friendly natural dyes. Natural dyes have been known for their use in coloring food substrates, leather, and natural fibers like wool, silk, and cotton as major areas of application since pre-historic times. Although this ancient art of dyeing textiles with natural dyes withstood the ravages of time, a rapid decline in natural dyes continued due to the wide availability of synthetic dyes at an economical price.

1.1 Statement of the problem

As the scope of organic and natural products is increasing day by day, the use of natural dyes in textiles is also picking up pace. In this scenario, lots of scientific research is going on to increase the use of natural dyes. Many researchers are trying to simplify the process of natural dyeing in many possible ways. Many studies are available in the literature

regarding the extraction, application, dyeing behavior, antibacterial activities, and others of many individual natural dyes. However, the reports on applying natural dyes in combination are very scanty. There is a well-established method for computerized color matching for synthetic dyes, but for natural dyes, such studies are not found in the literature. Readily available reports on compatible dyes will make it easier for natural dye users to produce a variety of mixed shades. Computerized prediction of recipes would further smooth the task of natural dyers.

Against this background, it is thought to provide a wide range of information on natural dye compatibility for selected dyes to the people working in large or small sectors and the researchers working in this field so that it may be easier for them to make mixed shades using natural dyes. Combinations of natural dyes in compound shades will provide a variety of newer or less common shades. In this study, therefore, an attempt will be made to find the gamut of compatible natural dyes, thus producing spectral data to formulate the recipe by spectrophotometer.

1.2 Objective of the Research

- To optimize the extraction process of selected natural dyes
- To find the optimal dyeing parameters of selected natural dyes on cotton fabric
- To dye the cotton fabric with binary and tertiary mixture of natural dyes
- Assessment of compatibility for a mixture of dyes by the use of different methods
- Spectral database creation for the selected dyes using a computer-aided spectrophotometer.
- To predict the recipe for certain standard shades using a spectral database in a spectrophotometer
- To analyze the fastness properties of selected dyed samples

1.3 Delimitation of the Study

- The study was limited to only 8 natural dyes, namely Marigold, Pomegranate, Madder, Sappanwood, Rhubarb, Annatto, Katha (Catechu), and Babool (*Acacia nilotica)*
- The study was limited to cotton and the use of alum mordant using the pre-mordanting method
- The study was limited to exhaust method of application

1.4 Scope of the Study

- The study attempts to find the optimized extraction conditions for selected dyes and optimized dyeing conditions for them on cotton fabric.

- The study will attempt to find out the compatible/ non-compatible set of dyes from a set of dyes using different methods. This will give rise to the possibility of producing new shades using compatible dyes.

- This study will attempt to predict the recipe using a spectrophotometer. The dyer can predict the recipe for a particular standard, as done in the case of synthetic dyes.