CHAPTER I

INTRODUCTION

Colour is such a vital and vibrant ingredient of our existence that it is difficult to imagine what life would be like without it. Colour is one of the elements of nature that made the human living more aesthetic and fascinating in the world. It is supposed to be associated with emotions, human qualities, seasons, festivals and passions in our life. Even in the prehistoric times, our ancestors must have noticed the abundance of a multitude of colours worn by nature. With the growth of civilization, it was realized that most of the colours he saw in nature (Clouds at Sunset, Flowers on Plants etc) were not permanent; the fading of the colours of flowers took place when their petals fell. The green colour of leaves changed in yellow or brown due to ageing. In his urge to make his world colourful, he tried extracting the colours from flowers plants and even animals. He found that these colours could be retained unchanged for a longer period unlike the natural thing wearing these colours. This led to the use of different types of natural colouring matters to dye clothes prepared from different natural fibres such as cotton, Linen, Wool, and Silk etc. He observed that some dyes, which produce intense action on woollen fabrics, did not even stain cotton clothes. A new class of dyes had to be used to dye cotton. Indigo, cutch, logwood, tyrian purple and henna were some of the natural dyestuff used for dyeing cotton fabrics (Shenai and Saraf 1991). This practice was common and prevalent in different periods of history, with the development of civilization; there was improvement in dyeing techniques. In India too, natural dyes had been used for dyeing as well as in cosmetics since prehistoric times (Shrivastava 1989). Use of natural dyes was common in most of the ancient civilizations e.g. India, Egypt, Greece, Aztec and others. In India, the use of natural dyes for dyeing, painting and printing goes back to the historic periods. This has been well established during the

excavations of Harrappan culture at Mohenjodaro when a cloth coloured with red dye was found during excavation. The coloured pottery excavated reveals that use of mineral dyes was in vogue in those days. In epics like Ramayana and Mahabharta description of clothes worn by ladies and gents of that time shows use of various coloured clothes special mention of'PITAMBAR' a yellow garment used by the gods, is noticeable. Atharveda carries description of natural dyes.

Bhrugu samhita is written using natural dyes. The frescos of Ajantha dating as far back as 1st century A.D. are painted with natural dyes. The later frescos evidence the use of colourful garments by men and women alike.

The evidence of use of natural dyes during pre-Muslim and Muslim period

(Mediaeval Period) of Indian history is much better preserved in the form of dresses, manuscripts and printing. Some of the records of the court historians (and biographers

• like Firdausi) are written and illustrated with natural dyes. The palace decoration and the ceiling of the temples of Hallebid and Bellur (In Karnataka) testify dyes. The coloured exquisite silk and Muslin fabrics of India had acquired fame throughout the world during the 16th and 17th centuries.

REVIVAL OF NATURAL DYES

During the period of the World War I (1914-18) the various textile industries of the world were paralysed on account of the complete stoppage of the export of synthetic dyes from Germany which practically held the monopoly till then.

Investigations were carried on in several institutions and organizations in India to receive the ancient, indigenous natural dyestuff industry. However, these attempts came to stand still with the end of World War I. During the span of 21 years since the termination of the World War I and the beginning of the World War II (1918-39) the textile industry along with

dyestuff industry forged ahead by leaps and bounds. The ultimate result was that the indigenous natural dyes which were being used by the artisans practically disappeared from the market, except few centres in Rajasthan,

Andhra Pradesh and little remote rural area where the craft is still practiced by the few devoted families of craftsman.

After independence, one of the policies of the Government of India was to revive and preserve the heritage and culture of India. Revival and development of dyeing and printing with the natural dyes was also covered under priorities. Various Government institutions such as the office of the National Handloom Development Corporation, Weavers service centres, voluntary organizations and individual environmentalists are making several efforts to revive the ancient industry, which was heading towards extinction.

ENVIRONMENT AND HEALTH AWARENESS

It is needless to talk about the rampant pollution that is met everywhere in the walk of life. It is noted that 1.0 million litters, (Kumar et al., 1993), of effluents are discharged by an average sized Textile Mill per day, having about 8000 Kg/day out of daily production. These effluents contains BOD (Bio-Oxygen Demand), COD

(Chemical Oxygen Demand), DO (Dissolved Oxygen), RC (Residual Chloride), TDS (Total dissolved Solids), pH alkalinity and acidity of the effluents and various other harmful compounds present in the effluents, which in any case if present beyond the limit of the standard (ISI) cannot be let out on land for irrigation. Neither it is permit table in to public sewers nor is it let out into in land surface water.

POLLUTION CONTROL STANDARD

The Bureau of Indian Standards (BIS) formulated a comprehensive standard in 1981 (IS: 2490) for the maximum discharge limits of various elements and other parameters. The standard takes into consideration the nature and area (in irrigation land, public sewer and inland surface water, e.g. river) for discharge. There is continuous evaluation by Central Pollution Control Board (CPCB), State Pollution Control Board (SPCB), BIS and other relevant authorities for the need of changing the pollution Control Standards. As a consequence, the IS: 2490 has undergone two revisions, viz., 1986 and 1991. The third revision (1991) is currently in force. Mukherjee (1995) [for reference, IS: 2490 (Part I), 1981.

The textile industry in particular process houses, consume large quantities of energy, water and chemicals/auxiliaries/dyestuff. Careful judicious selection and optimum handling of these inputs must be a primary objective. It may be emphasized that cleaner industries require collective long-term enthusiasm, willingness and commitment on the part of manpower (Gandhi 1995).

It has also been stated that as far as waste treatment is concerned, it must be emphasized that treatments simply convert waste/pollutant from one form to another.

For example, dyes and chemicals in liquid effluent are converted to slurry/sludge, which will have to be disposed off either by land filling or incineration. This may again contaminate the ground water. It is, therefore, better not to pollute rather than pollute and treat.

In recent years with the revival of the use of dyes, the colours of natural origin for coloring food, pharmaceutical, cosmetic and textile products are also being explored. This increasing demand for the material of natural origin is definitely because of the toxic nature of many of

the synthetic dyes and the natural dyes are becoming widely recognized throughout the world. Natural dyes are of animal, vegetable and mineral origin. The greatest source of dyes has been the plant kingdom, notably roots, berries, barks, leaves and wood, but only a few have been used on a commercial scale. These dyes are a class of colorants extracted from vegetative matters and animal residues. Most of the natural dyes are mordant dye as they require the inclusion of one or more metallic salts or natural mordants like myrobolan (*silikha*) for ensuring reasonable fastness of the colour to sunlight and washing. Metal ions of inorganic mordants act as electron acceptor for electron donors to form coordination bonds with the dye molecule, making them insoluble in water (Mongkholrattanasit et.al., 2011). Mode of chemical interaction of natural dye from marigold flower and organic mordant like pomegranate*(Punica granatum)* and *silikha* extract is under study.

SIGNIFICANCE OF THE STUDY

Use of natural dyes along with safe chemicals can reduce the effluent treatment cost, which will help to reduce the cost of production.

Natural dyes are an ideal choice for a cleaner, less polluting, and cause less damage to the textile substrates. They are obtained from renewable resources with no health hazards. They are Biodegradable. Practically no or mild chemical reactions are involved in their production. Lot of creativity is required to use these dyes judiciously.

It would be fair to justify the need for promoting and using natural dyes for dyeing and printing of natural fibres such as cotton and silk as they are known for their richness, comfort and biodegradability.

AIMS AND OBJECTIVES

1. To study of effect natural dyes extracted from marigold flowers applied on cotton and silk fabric.
2. To identify the suitable method to overcome poor colour fastness properties.
3. To study the effect of combination of different natural extracts for shade variation.

MATERIALS AND METHODS

Materials used for the study are given below:

a. **Dye material**: Marigold flowers were plucked from the garden.

b. **Fabric:** Plain weaves 100% pure cotton and mulberry silk fabric was used.

c. **Mordants:** Aqueous extract of *(Punica granatum),* Myrobolan (*Terminatia chebula*), AR grade Potassium Aluminium Sulphate and Copper Sulphate.

Experimental Method was adopted for the study

Experiments were divided into various steps. They are:

1. **Preparatory process:** Degumming for silk and scouring for cotton were done to remove natural/added impurities. The fabrics were purified by scouring in a solution containing 2g/lt of detergent for 30 minutes at room temperature. Then the samples were thoroughly rinsed with distilled water and finally dried at room temperature.
2. **Extraction of the dye:** The dye was extracted from the marigold flower by boiling 20g in 1 liter of distilled water for 1 hour.

3. **Chemical nature of the Dye extract**: The pH of the aqueous extract was determined with a pH meter and found to be 5 which reveal acidic nature of the dye.

4. **Dyeing and Mordanting**:

The two fabrics, cotton and mulberry silk were treated with different mordants (*Punica granatum,* myrobolan, potash alum and copper sulphate). Three conventional processes of mordanting were used- pre-mordanting, simultaneous mordanting and post-mordanting. After dyeing, the dyed sample were washed with distilled water and dried at room temperature (Kulkarni et. al. 2011;Pruthi et.al., 2008; Jothi, 2008; Ghoreishian et.al. 2013)[5,6,7,8]. Dyeing on un-mordanted cotton and silk fabrics were also done to get the control sample for comparison of colour differences with the mordanted samples.

5. **Fastness Testing**

The dyed samples were tested for light fastness and wash fastness. Light fastness was analyzed by exposing the dyed fabric to direct sunlight for 24 hrs. The wash fastness was carried out by washing the dyed samples with nonionic detergent (1g/lt).