

History of Dyestuff

What is color and its uses

- Color and its various uses come over the horizon from pre-historical period by all cultural groups and on all major land masses. The ancestors of man must have noticed (perhaps with or without understanding) the abundance of multitude of colors worn by nature. Certainly it would have been fascinating to them. Every civilization has its myth and association with color. Aristotle, the great philosopher of the fourth century BC, considered yellow and blue (www.colour-affects.co.uk Color Affects- History of Color) to be the two primary colors relating to life's polarities. A physicist considers that black and white are no colors. Psychologically, however black and white are colors because they produce visual sensation and they have strong effects on other colors either by mixing or by juxtaposition. The greatest contribution to our understanding of color came from men whose work combined science and mathematics with art, metaphysics and theology - indeed the sum of human study.

Colorant

“Colorant” is used as a name for materials such as dyes and pigments. Ability of natural colorant to be used as natural dyes has been known since ancient times. A dye can generally be described as “a colored substance that has an affinity to the substrate to which it is being applied”. The dye is usually used as an aqueous solution, and may require a mordant to improve the fastness of the dye on the fiber. In contrast, a pigment generally has no affinity for the substrate and is insoluble.

Chief Source of color

The chief source of coloring matter, until about a century ago, had been nature in general and vegetation in particular. Man learnt to use different kinds of natural coloring matters to dye cloths. Biochemists have identified that the vital activity of plants is also dependent on colorants in the way that the bright color of flowers are important in attracting insects and birds to act as pollinators. When these are used for dyeing fabrics, they not only impart color to the fabric, but also act as antifungal agent whereby they impart protection to fabric against bacterial or fungal infections or as moth reluctant. Some dyes like Indigo has a cooling sensation also.

What is Color?

Color is one of the elements of nature that made the human living more aesthetic and fascinating in the world.

They are supposed to be associated with emotions, human qualities, seasons, festivals and passion in our life. In the past, at dawn of the civilization, the people tried to ornament their surroundings similar to that of natural colors observed in the plant, soil, sky and other sources.

This gave birth to a new science of colors from natural origin.

How old is the art of dyeing

The art of dyeing was as old as human civilization. From the historical records, it is learnt that natural colorants were available to people during Greco-Roman periods.

Our Vedas, the Atharveda carries description of natural dyes. The use of natural dyeing materials is evident with the wall paintings of Ajanta, Ellora and Sithannvasal and they still demonstrate the efficacy of dyeing craft that had been inherited from ancient times in India.

Ancient Egyptian hieroglyphs contain a thorough description of the extraction of natural dyes and their application in dyeing. Further developments extending over many thousands of years led to rather complicated dyeing process and high quality dyeing.

Use of Natural dyes

- Ever since primitive people could create, they have been endeavoring to add color to the world around them. They used natural matter to stain hides, decorate shells and feathers, and paint their story on the walls of ancient caves. Scientists have been able to date the black, white, yellow and reddish pigments made from ochre used by primitive man in cave paintings to over 15,000 BC
- Natural dyes have been used since ancient times for coloring and printing fabrics. Until the middle of last century, most of the dyes were derived from plants or animal sources by long and elaborate processes. Among these Indigo, Tyrian purple, Alizarin, Cochineal and Logwood dyes deserve special mention.

How dyeing was done earlier

Since the difference in mordanting different fibers has been mentioned, it would be remiss not to spend a moment on the historic nature of the fibers themselves. Wool, a protein-based fiber, has been found in Europe dating back to 2000 BC.

It was a common medieval fabric in both dyed and natural colors, and was processed by both professional manufacturers and housewives. Silk, another protein-based fiber, was imported from China to Persia as early as 400-600 BCE. It became quite popular in the Late Middle Ages, and major silk manufacturing centers were set up in France, Spain and Italy.

These silk production centers also became centers of dye technology, as most silk was dyed and required the highest quality dyes available. Cotton was considered a luxury fabric, as it was imported all the way from India and usually dyed or painted before it was shipped.

What was practiced and How??

- Scientists are almost certain that dyeing was practiced throughout the world, but it is difficult to obtain proof on this for two reasons. First, not all cultures left written records of their practices. Second, because of the wide variance of environmental conditions and degree of geological disturbance, it is not easy to find well-preserved evidence of dyed textiles in many archaeological sites.
- Cotton was also valued because of the brightness and colorfastness of the dyes used to color it, and also for its use in making candle wicks.
- Samples of cotton fabrics have been found in India and Pakistan dating to 3000 BC, but it did not appear in Europe until the 4th century.

How did it happen

- Cotton weaving establishments were formed in Italy in the 13th & 14th centuries but they did not make a significant economic impact on the industry as they produced a coarser quality of fabric than the imported fabric, and therefore had difficulty in obtaining a good supply of cotton fiber.
- A Chinese text from 3,000 BC lists dye recipes to obtain red, black and yellow on silks. Ancient Indian texts describe several different yellow dyestuffs, how to obtain reds from the wood and bark of certain trees, and also notes the use of indigo to create blues on cotton. In Central and South America they dyed bast fibers (plant fibers) in shades of red and purple with the bodies of the cochineal insects (*Dactylopius coccus*).

The Greek Artifact

- A Greek artifact known as the Stockholm Papyrus details dyestuffs and techniques in almost a recipe fashion as it was practiced Egypt in the third and fourth centuries CE. The great detail in which the preparation of the fibers and the dyeing materials and the dyeing process itself are recorded has led scholars to believe that it had to have been practiced for thousands of years previously in order to raise the process to such a science and art.
- It discusses mordanting the fibers using alum, copper and iron oxides to darken or “sadden” the red, blue, green and purple dyes, as well as the occasional use of tin and zinc. It describes over ten different recipes for using alkanet (*Anchusa tinctoria*) root as a dye employing camel and sheep urine, lentils, vinegar, wild cucumber and barley malt among others as aids to producing color. It also gave recipes on obtaining purple hues by overdyeing the alkanet with woad (*Isatis tinctoria*), madder (*Rubia tinctorum*), kermes (made from the dried bodies of the female shield louse or scale insect (*Kermes ilicis*)) and the heliotrope plant (*Heliotropium arborescens*).
- Excavated coptic textiles dating from the fourth to the sixth century show use of weld (*Reseda luteola*) to produce yellow, madder and woad for dark purple, and blue from indigo (*Indigofera tinctoria*). Scientists have been able to date a red obtained from Egyptian madder root from the fourteenth century BC.

What does History tell us

The earliest written record of the use of natural dyes was found in China dated 2600 BC (www.quilthistory.com *Quilt History - The earliest dyes*). Chemical test of red fabrics found in the tomb of King Tutankhamen in Egypt showed the presence of alizarin, a pigment extracted from madder. Tyrian purple, a well renowned natural dye, occupied a prominent position in Roman history (*Schetkly, Ethel jane Mc. D., 1986*). Indigo has been used in the textile industry for the last several thousand years. It is one of the earliest dyestuffs recorded in history and still retains its supreme importance even today.

In Europe how did it begin

In Europe, the art of dyeing rose to heights influenced by the direct impact of trade, which was instigated by the Crusades and the growing cultural awareness of the Renaissance period. Among the major early centers for imported dyestuffs was Venice, supplying Brazil wood (*Caesalpinia sappan*) from the East, Lac (Insect dye) and Indigo from India from fifteenth century AD onwards. In 1429, the Venetian dyer's guild documented recipes on different dyes (*Schetky, Ethel jane Mc. D., 1986*). Woad was grown locally in different regions of Germany from 12th to 14th centuries A.D. and trade fairs were organized with strict legislation on every aspect of the trade (*Grierson, Su., 1989*).

Central America

Around 1587, the lucrative monopoly of cochineal dye industry (red dye from the bodies of cochineal bugs of Central America) was controlled by Spain, when the intense colorific value and the relative low cost of the dye eliminated the use of expensive dye extracted from kermes in England (*Grierson, Su., 1989*).

European dyers reached their height of skill in the 13th century mainly due to the guild system which vigilantly maintained high standards of quality. France had developed an expensive and efficient dye industry by the thirteenth century.

At the end of the sixteenth century, over 220 master dyers were listed in Paris alone (*Schetky, Ethel jane Mc. D., 1986*). By seventeenth century, the world wide shipping and trading network allowed the import of dyestuffs from all parts of the world to Europe. In eighteenth and nineteenth centuries, the practice of colonialism improved supply of foreign dyestuffs and the industrial revolution made huge demands of large scale production of natural dyes.

Development of Natural dyes

The development of natural dyes took place at the same time after the technique of weaving had been discovered in about 5000 BC. In India, the use of natural dyes for dyeing, painting and printing goes to the prehistoric periods. Ajanta paintings, dated as far back as 1st century AD, were painted with natural dyes. These paintings are the evidence of the use of colorful garments worn by men and women of that era. Natural dyes can be categorized under vegetative or animal origin. Until the latter half of the nineteenth century, all dyes with the exception of few mineral colors were of animal or vegetable origin. Coloring matter was extracted from the roots, stems, leaves, flowers, barks and fruits of plants and from certain insects and shellfish by an elaborate series of extraction processes.

Natural dye a part of Indian culture

Natural dyes are not new especially for Indian culture. It is an ancient craft rich in history and tradition. The first colors used for textile were probably little more than stains. Bright yellows and yellows oranges from turmeric, saffron and annatto; and pinks and rose pinks from safflower were undoubtedly used quite early. People used these dyes directly, without any chemical processing, as crude mixture of colors. As development took place among the civilization, man discovered several sophisticated procedures for dyeing textile. Yet there is a great need of research to be done in this field.

Introduction of Synthetic dyes

In 1856 William Henry Perkin, an English chemist, while attempting to synthesize quinine from aniline, a coal tar byproduct, accidentally produced and discovered "mauve" the first synthetic dye. The color quickly became the favorite of royal family and a new industry was born-Dyestuff Industry. The advent of synthetic dyes and their immediate acceptability throughout the world due to wide range of colors and good color fastness properties resulted in the limited use of natural dyeing.

In India

Until the middle of Nineteenth century all the textiles were, if necessary, dyed/ printed with the use of natural products.

Naturally, various recipes/ procedures were in practice in different parts of the country depending upon the availability of local special vegetable products and stage of local standardization/ skill achieved by local craftsmen.

After independence, the new Indian government recognized the importance of traditional arts in Indian society and took steps to support and preserve there revival by establishing state and local boards.

Indian Strong Tradition

India has been prominent as producer of textile and has strong tradition in the making, dyeing, printing and embroiding of cloths since ancient times. The evidence of madder-dyed cloth(Miyazawa, M, Osman, F., Natural Product Letters 2001, 15, 171. found at the excavation of Harrapan Culture at Mohenjodero in the Indus river valley dates the use of mordant-resist dyeing to 5000 years ago. Tinctorial properties of Kala and Asikini (possibly indigo), Maharanjana (safflower), Manjistha (madder), Lodhra (*symplocos racemosa*), and Haridra (turmeric) were recognized in the Vedic period , particularly in the Athervavedic and the succeeding period (5000BC-1000BC

Post vedic scenario

The post vedic period (500 BC) saw the introduction of natural dyestuffs like Kumkuma (saffron), Nila (Indigo) among plant products, kerme (kermes) and Recona (bright yellow substance prepared from cow's urine) among the animal substance and Gairica (red ochre) among minerals beside, Khanjana (carbon black). The word Indigo is derived from the greek Indikon and the latin Indicum, meaning a substance from India, and its use in the medieval age is found in the writings of a trader in Egypt in the 1st century AD. A collection of 168 specimens of fabrics dyed by indigenous processes were kept in the Bengal Economic Museum, Kolkata.

Decline in textile trade

There was, however a marked decline in textile trade by the end of the 18th century. Political instability, influx of synthetic dyes, machine made textiles and British monopolies of India's production all contributed to this decline.

However Natural dyes continued to be extracted and used like Andhra Pradesh, (Mutua Bahadur, "Traditional Textiles of Manipur", Mutua Museum, Keisampat, Imphal, 1997, 25.) Begru (Rajasthan), Ahemadabad (Gujarat), Sangarer, Bharivgarh, Berhampur (Orissa), Kotapad (Orissa), Imphal, Kodompokpi (Manipur) Khensa and Akoya (Nagaland), Darjeeling (Tibatan refugees), Gangtok and many North eastern hill areas in recent Years.

Renewed Interest

- Eventually, the old natural dyes lost popularity in favor of the newer synthetic ones. By the end of the nineteenth century a few Scottish tweed producers were the only ones still using natural dyes, and now the use of natural dyes on a commercial scale barely exists, mainly in remote areas where people have either little access to synthetic dyes or a vested interest in retaining their ancient dyeing customs.
- Use of natural dyes is gaining popularity again with the renaissance in hand crafting, most notably in the fields of spinning and weaving, basketry, papermaking and leathercraft. There is also renewed scientific and historic interest in natural dyeing, both to help identify dyestuffs in recently discovered archaeological finds and to preserve the dyed textiles housed in museums and private collections.
- As Su Grierson says in her book *Dyeing and Dyestuffs*, “Whilst the dyeing industry of today keeps pace with modern science, the future use of natural dyes will also follow a new path, but one firmly rooted in tradition.”