[Article ID : 01/IV/10/0421]

NATURALLY COLOURED COTTON : AN ALTERNATIVE FOR TEXTILE INDUSTRY

Mali Bharat[1]*, P. B. Wadikar[2] and Gorte Amruta[3]

[1&3] M.Sc. (Agriculture) Genetics and Plant Breeding
[2] M.Sc. (Agriculture), Ph.D.
[1, 2&3] Vasantrao Naik Marathwada Agricultural University
Parbhani (MS) India

Introduction

Cotton is an ancient fibre known for its versatility, natural comfort and performance. But the process of cultivation of cotton involves the application of pesticides, and chemical fertilizers, much of which are causing devastating health hazards. Textile industry is also condemned for is usage of chemicals in the dying process. Approximately 10-15% dyes are released into environment during the dyeing process making the effluent highly colored and aesthetically unpleasant.Growing cotton without chemicals and harmful pesticides is now considered environment friendly and biodynamic. It is a positive solution to all the health hazards caused by conventional cotton cultivation, and dyeing process. Naturally pigmented cotton eliminates all the issues regarding processing and dyeing. Naturally colored cotton dates back to more than 5000 years. Historical evidences exist regarding the usage of naturally colored cotton with pink and brown tint. They are naturally pigmented fibres. The color of the cotton comes due to the plants inherent genetic properties. Based on climate and soil variations, the shades may vary.

What is dyeing?

Dyeing is the process of applying the coloring matter directly on fiber, yarn or fabric without any additives. Natural dyes were used only for coloring of textiles from ancient times till the nineteenth century. As the name suggests, natural dyes are derived from natural resources. Coloring materials obtained from natural resources of plant, animal, mineral, and microbial origins were used for coloration of various textile materials. Today is world of most scientific and advance level of dyeing. There are huge number of processes to do coloration. Natural and manmade colours are also used. In this paper, the natural dyes are extracted and fabric dyeing is analyzed by applying dye on 100% pure cotton.

Scenario in India

Cotton with naturally coloured lint, other than white, is commonly referred as coloured cotton. In nature, coloured and white linted cottons are found from time immemorial. Coloured cotton is being grown and used by mankind since 2500 B.C. The Old World Asiatic diploid cottons are presumed to originate earlier than New World allotetraploid cottons. Coloured varieties were known in diploid cottons and were under cultivation in Asia, particularly Indian subcontinent, China and Central Asian Republics of former Soviet Union since long.

In India, brown linted varieties of tree cotton (G.arboreum L.) namely Cocanada 1, Cocanada 2 and Red Northerns were under commercial cultivation mainly on black soils under rainfed condition in parts of Andhra Pradesh. Red linted types were predominant and high in demand for their better dyeing qualities and colour fastness. However, the situation has changed with the advancement and standardization of dyeing techniques. Cultivation of coloured cotton was discouraged and almost abandoned in the latter half of this century. Coloured linted varieties could not remain popular with growers, mainly because of low productivity per unit area, poor fibre characteristics and non-uniformity of colours. Need of the hour was to increase cotton production in order to meet

the basic requirements of ever increasing population for clothing. With the advancement of spinning and processing technologies, ease in imparting varied treatments of shades and colours during processing specially with the advent of synthetic dyes, greater emphasis was given in production of high yielding cotton with superior fibre quality, which resulted in the replacement of coloured cotton by white linted types. Yet, cultivation of coloured cottons continued in isolated pockets as novelty niche cotton and for aesthetic purpose.

Types of Lint Colour

The lint colour of cotton under commercial cultivation is often white. In the cultivated species, brown and green colours are most common. Some of the genotypes in germplasm collection of USA and Russian Republics are reported to have coloured lint with shades of pink, red, blue, green and also black. However, genotypes with multi coloured lint have not yet been made available to the researches nor produced on large scale. The two commonly occurring lint colours, i.e. brown and green are briefly discussed below:

Brown colour

Among the coloured cottons, brown is the most common colour. The brown colour is found in different shades which ranges from light brown to intense mahogany red. Depending on the intensity of colour, it is named as light brown, khaki / camel colour, brown, dark brown / chocolate colour, dirty grey, tan and red. Brown colour is found in all the four cultivated as well as many of the wild species. Brown colour is more stable than green colour. On continuous exposure to sunlight, brown colour also fades but gradually at a very slow rate. In India, brown linted varieties of *G.arboreum*, namely, Cocanada-1, Cocanada-2 and red Northern were under commercial cultivation during first half of the 20th century.

Green colour

Green is the second important commonly occurring lint colour in cotton. Green colour is less common than brown and occurs mainly in two shades i.e. light green and green. Green colour is more prone to fading, fades faster than the brown colour. Prolonged exposure to sunlight during boll opening leads to rapid fading of green colour and the colour turns to white, off-white or brownish. Portion of lint which is not directly exposed to sunlight retains its original lint colour. Green colour is mostly observed in *G.hirsutum* and probably varieties possessing green lint have not yet been released for commercial cultivation.

Source of Lint Colour

Germplasm collection : Genetic resources are most vital for improvement of any crop. In India, about 40 coloured genotypes of upland cotton (*G.hirsutum*), mostly of various shades of brown and green colour are available in the National Gene Bank of Cotton maintained at the Central Institute for Cotton Research, Nagpur.

Wild species : Wild species are important sources of coloured lint. Many of the wild species of genus Gossypium, including putative donors of present day tetraploid cotton i.e. G.herbaceum race africanum and G.raimondii have coloured lint. The brown colour in different shades is most common.

Development of Lint Colour

Lint colour is a genetically controlled character. Accumulation of pigments in the lumen of lint starts before boll bursting. In upland cotton (G.hirsutum), pigmentation starts appearing in the developing lint 32 days after fertilization and it takes nearly six days to develop colour. In Asiatic cotton (G.arboreum) colour pigments observed 46-47 days after fertilization which take 5-6 days for colour development. However, complete expression of lint colour takes place only when the boll bursts open and the lint is exposed to sunlight. It takes about a week for the lint to develop a complete natural colour. The intensity and the time taken for complete development of colour varies with the genetic background of the genotypes.

Advantages of Coloured Cotton

Effect on Human Health : Cotton fabrics with artificial dyes have been reported to have adverse effects on the skin and human health. Artificial dyes cause allergy and itching on the skin and sometimes may cause skin cancer. The fabric prepared from naturally coloured cotton lint is free from such adverse effects. There is no need of using artificial dyes, when the fabric is manufactured from naturally coloured cotton. Such fabric manufactured from coloured cotton has been found to be the best for human health.

Effect on Environment : Various artificial dyes are being used for dyeing of cloth manufactured from the white lint. After dyeing, the chemical residues in the form of dyeing or finishing affluents are thrown in nearby river contaminating water and soil. This form a major source of environmental pollution. When the fabric is manufactured from naturally coloured lint, there is no need of artificial dyes. Thus use of naturally coloured cotton helps in reducing environmental pollution caused by artificial dyes.

Effect on cost of Fabric Production : The dyeing process adds to the cost of production of fabric. The dyeing process is omitted when naturally coloured lint is used for manufacturing of the fabric.

Thus the cost of production of fabric can be reduced to some extent through the use of naturally coloured cotton. If the coloured cotton is paid higher price than white cotton, then the reduction in the cost of production of fabric caused by omitting dyeing process is compensated by high price of coloured cotton fabric.

Limitations of Coloured Cotton

- Low Yield Potential.
- Poor Fibre properties.
- Limited Colours.
- Instability of colours.
- Low Market Demand

Conclusion

The future of naturally coloured cotton will eventually depend on how strong the market demand grows. Currently there is a limited niche market from special consumer groups who may prefer organically grown naturally coloured cotton. While naturally coloured cotton is a precious natural resource that needs to be conserved, the future would depend on how preciously and collectively we treat this precious resource.