CHAPTER 12

APPLICATION OF HERBAL FINISH TO ALKALI TREATED POLYESTER COTTON WEFT KNITTED FABRIC

12.1 INTRODUCTION

Research on eco-friendly antimicrobial finish textiles is an emerging area today. Rao et al (1986). Natural herbal products are attractive alternative to synthetic agents for imparting antimicrobial properties to textiles since there is a tremendous source of medicinal plants with bioactive agents in India. Neem extract is one such type of product which is extracted from seed, bark or leaves of Neem tree (Azadirichta indica) belonging to Mahgony family and found abundantly in the Indian subcontinent. It has an excellent potential as antimicrobial agent (Chaurasia and Jain 1978) as it has been firmly established that the Neem extracts and its main active compounds i.e., azadirachtin salannin and meliantriol are insect growth regulator and antifeedent. (Mordue and Blackwell 1993). Neem also possesses the ability to inhibit the growth of the bacteria.

The present study focuses on the development of antibacterial as well as insect repellent polyester cotton fabric using Neem extract as an antibacterial agent. Since synthetic fibres such as polyester have no surface active groups like - COOH - OH etc. to have good adhesion with the finishing agent for getting barrier properties against microbes and different types of insects, several approaches for generating functional groups on the surface of polyester are reported.
In the present study the polyester cotton blended knitted fabrics were surface activated by alkaline hydrolysis prior to treatment with antimicrobial agent (Neem extract).

12.2 MATERIALS AND METHODS

12.2.1 Materials

Polyester cotton weft knitted fabrics containing 35/65, 50/50 and 65/35 blend composition were considered.

12.2.2 Methods

The fabrics were treated with 20% sodium hydroxide for 30 min at 70°C. Neem seed extract was applied to the alkaline treated knitted fabrics through cross linking agent such as citric acid. The antibacterial effect has been tested for the finished fabrics against Gram - positive (Staphylococcus aureus, Klebsiella pneumoniae) using colony counting methods (quantitative) AATCC Test Method 147 - 1998. The durability of the finished fabric has been checked after 1, 5 and 10 machine - washes. Neemazal Technical (seed extract from Neem tree) was used as a natural antimicrobial agent which was supplied by EID (Parry, India Ltd.)

Treated samples were washed with 2g/l lissapol N and 2 g/l soda for 30 min at 50°C and dried at room temperature. Sample treated with cross linking agent serves as control sample.

Infra red spectroscopy (1R) of treated samples was carried out in pellet form, made from finally chopped fibre (2 mg) and KBr (45 mg) using 400 kg/cm² pressure for 10 min on Perkin Elmer BX11 FTIR spectrometer. All the data were taken on transmittance mode.
12.2.3 Scanning electron microscopy (SEM) analysis

Antibacterial properties of Neem extract treated fabrics and the bacterial adherence on to the fabric were examined by scanning electron microscopy (SEM).

12.3 RESULTS AND DISCUSSION

Polyester cotton blended fabrics in particular 50/50 blend hydrolysed with 20%. NaOH (70°C for 30 min) gives remarkable antimicrobial activity of 100% against Staphylococcus aureus (Gram - positive bacteria) using 10% w/v Neem seed extract even after one washing without using any cross linking agent.

Hydrolysed polyester cotton blended fabrics treated with 10% w/v seed extract showed antimicrobial activity of 95-100 after one washing against Klebsiella Pneumoniae. This may be due to physical and hydrophobic interaction between the hydrolysed PET and the Neem seed extract. Figure 12.1 illustrates the reduction in bacteria.

Figure 12.1 Bacterial reduction to Neem extract
12.3.1 Scanning electron Microscopy (SEM)

SEM micrographs in Figure (12.2-12.4) clearly indicate that the Neem extract acts as an effective bactericidal agent on to the fabric and inhibits the growth of bacteria on to the textile surfaces.

Figure 12.2 SEM Photo Graph of 65/35 Polyester Cotton Blend

Figure 12.3 SEM Photo Graph of 50/50 Polyester Cotton Blend
12.3.2 FTIR Analysis

Figures 12.5 – 12.10 show the spectra obtained from FTIR. IR spectra of neem terpenoids show that these terpenoid give four characteristic stretching bands.
Figure 12.6 FTIR Spectra for 35/65 treated

Figure 12.7 FTIR Spectra for 50/50 treated
Figure 12.8 FTIR Spectra for 65/35 untreated

Figure 12.9 FTIR Spectra for 35/65 untreated
12.4 CONCLUSION

- In the current trend of textile market new product are hitting the market every day with varied technical aspects.

- In this study, the market available cotton and polyester fibres are made into knitted fabric and then alkali treated.

- The alkali treatment process enables better absorbance of moisture and also allows better finish pickup.

- After alkali treatment the cotton is mercerized and pitting is formed on the surface of polyester fibres.

- This pits enable the deposition of neem particles onto the surface of the fibres.

- Neem is an natural anti-infectant and has an aesthetic appeal towards people more than chemical anti-infectants. Hence neem finished fabric can be used as hospital bed covers, as interlining in diapers and such other applications where anti-microbial properties are very much required.