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Title: Development of shades on wool with *Acacia nilotica* (Babul), *Terminalia arjuna* (Arjun) and *Adhatoda vasica* (Vasaka/Malabar Nut) natural dyes and their characteristics evaluation

ABSTRACT

With the public enhanced awareness towards eco-preservation, eco-safety and health concerns, environmentally benign, non-toxic and sustainable bioresource materials produced mainly from non-food crops have revolutionized all industrial sectors particularly textile industry. In recent years, textile industries in developed countries are getting increasing attention due to varied and changing world market conditions in terms of price, durability and fibre mixtures as well as design, colours, weight, ease of handling and product safety. The increasing environmental and health concerns owing to the use of large quantities of water and hazardous chemicals in conventional textile finishing processes lead to the design and development of new dyeing strategies and technologies.

Nature has always been fascinating mankind with brilliant and soothing colours. Human being has always been interested in colours, from time immemorial. People used to exploit roots, stems, barks, berries, leaves and flower extracts of various plants for colouring of synthetic as well as natural textile materials. Natural dyes, obtained from plants, insects/animals and minerals, without chemical processing are renewable and sustainable bioresource products with minimum environmental impact and are known since antiquity for their use, not only in colouration of textiles but also as food ingredients, cosmetics and medicine. Recent upsurge in the research and advancements in

natural dye production and application is observed due to eco-friendliness, biodegradability, eco-safety and their increasing popularity in the development of systematic, scientific and diversified smart textiles materials. In addition to the development of harmonizing elegant and sober shades on different textile materials, natural colourants from wide range of plant and insect/animal sources have been discovered to be novel functional finishing agents such as insect repellent, deodorizing, anti-feedants, antimicrobial, fluorescence, and UV protection properties.

The thesis contains nine chapters. **First chapter** is introduction describing upto-date systematic literature review on natural dyes, their classification and sources, common textile fibers, mordants and mordanting methods, chemical and physical aspects of wool dyeing, chemical modifications of wool fiber, and innovative functional finishing of textile materials with natural dyes and their composites. **Chapter 2** deals with the materials and methodologies used in this research work. **Chapter 3 & 4** contain the studies on applications, dyeing properties, colorimetric characteristics, fastness analysis and fluorescence finish of woolen yarn dyed with *Acacia nilotica* natural dye. **Chapter 5 & 6** deals with the studies on antimicrobial and fluorescence finishing of woolen yarn with *Terminalia arjuna* natural dye as an ecofriendly substitute to synthetic antimicrobial agents along with the effect of different metal slats on finishing properties. Also thermodynamic and kinetic studies of dye adsorption were studied during the course of work. **Chapter 7 & 8** contain adsorption and kinetic studies of *Adhatoda vasica* natural dye and the detailed ecological dyeing of woolen yarn in presence of biomordants as an alternative co-partner to metal salts. **Chapter 9** of the thesis describes the summary, conclusion and future prospectus of the research work.