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Title of Thesis: "Development of shades on wool with Dolu/Indian Rhubarb (*Rheum emodi*) and Kamala powder (*Mallotus philippinensis*) and their characteristics evaluation".

Findings

In this research work is an attempt to investigate the possibilities of dyeing woollen yarn samples with Dolu (*Rheum emodi*) and Kamala (*Mallotus philippinensis*) natural dyes and to standardize the dyeing recipe for the same. By varying the amount of both, mordants as well as dyes three hundred and sixty shades were developed and an attempt was made to standardize their recipe.

Procedure of mordanting, dyeing, tests conducted to evaluate the fastness properties with respect to light, wash, rub/crocking, recording the colourimetric parameters, colour strength (K/S) values, and Scanning Electron Microscopy (SEM) of woollen yarn samples showing surface morphology and FTIR spectra of the woollen yarn samples were described. The antimicrobial activity of *Rheum emodi* against common microbes (*Candida albicans*, *Candida tropicalis*, *Escherichia coli* and *Staphylococcus aureus*) were also investigated. Most of the dyed woollen yarn samples have moderately good to good light fastness ratings ranging from 3-5 on grey scale. Most of neutral shades have fairly good to very good wash fastness ratings of 3-5 except few shades. Most of the acidic shades have good to very good wash fastness rating of 4-5 and most of the alkaline shades have moderate wash fastness rating of 2. No staining on adjacent cotton fabrics were observed whereas light to very light staining on adjacent wool fabrics were observed. Dry rub fastness for most of the dyed woollen yarn samples were found fairly good to very good ratings ranging from 3 to 5 on grey scale. a*b* plots show that the colour gamut of woollen yarn samples dyed with dolu/Indian rhubarb (*Rheum emodi*) indicates only a red yellow

zone on the Analab colour space. K/S value graphs show that the woollen yarn samples dyed with Dolu/Indian rhubarb (*Rheum emodi*) exhibit considerably high K/S value. SEM photograph for the untreated wool shows a normal morphology. For the mordanted woollen yarn samples some particles of the mordants have been found on the woollen yarn surfaces. The mordanted woollen yarn samples dyed with Dolu/Indian rhubarb (*Rheum emodi*) show the deposition of dye molecules on woollen yarn surfaces. *Rheum emodi* extract was found active against all the tested microbes in solution as well as after application on woollen yarn. Dye was found equally effective against both fungal and bacterial strains. Mordants shown to have positive effect on colour strength as well as fastness properties but lowered the antimicrobial activity to some extent.

This effort shows that *Rheum emodi* dye can be suitably used for producing value-added environment friendly woollen apparel and other textile products to be washed in non-ionic detergent to fulfill the global needs of fresh and hygienic clothing and textiles.

By changing the concentration of dyes and mordants and mixed mordants, shade variation in woollen yarn samples were observed. Mordants are shown to have positive effect on colour strength as well as fastness properties of dyed woollen yarn with Dolu/Indian rhubarb (*Rheum emodi*) and Kamala powder (*Mallotus philippinensis*).

Dyeing with Dolu/Indian rhubarb extracts resulted in bright yellow – greenish brown to dark reddish brown shades while Kamala mostly yielded brilliant yellow shades.