

ABSTRACT

Indian woolen industry, comprising apparel and carpet sectors, gives employment to around 12 lakh people and earns nearly Rs.3000 crores from export of woolen and its allied products. Its competitiveness in the global market is very high. In order to compete with global market, attention should be given to improve the quality of the woolen products especially in terms of its feel. Specifically there is an enormous scope for improving the aesthetic properties of wool and speciality hair fibre products by various chemical treatments like enzyme treatment and silicone finishing. The application of such chemical treatment(s) either in individual form or in successive form on woolen materials improve their functional as well as aesthetic properties and fetch more value.

Wool fibres with different diameter and medullation and Angora rabbit hair were treated in fibre form with thioglycollic acid, sodium bisulphite in water, sodium bisulphite in ethanol, formic acid, morpholine, sodium hydroxide and a protease enzyme. From the physiochemical and mechanical properties of chemically treated wool fibres and angora rabbit hair, it is revealed that protease enzyme treatment and sodium hydroxide treatment are suitable for wool fibre and rabbit hair respectively, since they improved the dyeing and chemical properties of the wool fibre and rabbit hair significantly with tolerable loss in strength. The behaviour of Angora rabbit hair towards various chemical treatments was also similar to that of fine wool fibres.

The Angora rabbit hair was treated with sodium hydroxide and blended with staple viscose rayon fibre in 20:80 ratios. The blended mixture was spun into blend yarn of 21.03's count with 24.48% coefficient of variation in a cotton spinning system. The above said blend yarn was taken as weft and grey cotton yarn (2/40's) as warp, and they woven into a union fabric. The grey union fabric was enzyme desized, mild scoured and cold bleached. The bleached fabric was treated with ten different finishing formulations and their performance properties were evaluated. The properties of the finished fabric resemble the desirable properties of a woven cotton fabric in which Ceraperm-TOWI and Ceraperm-MW finishing showed better softening effect than other finishing chemicals. The wool, rabbit hair and cotton fibre substrates were treated with natural ingredients such as aloevera, chitosan and curcumin separately as well as combinations with each other, with and without pretreatment by exhaustion method. Combined application of three ingredients (Aloe vera+Chitosan+Curcumin) on pretreated wool, rabbit hair and cotton fibre substrates shows very good antimicrobial activity and it lasts up to 25 washing cycles in these three fibre substrates.

Central Sheep and Wool Research Institute, India (CSWRI) had developed wool/cotton union fabric of different specifications from Bharat merino woolen yarn as weft and cotton yarn as warp. The wool/cotton union fabric was treated with a cellulase enzyme (Bactosol-CA) followed by a protease (Bactosol-WO/Papain-URPP/Savinase-16.0L Ex) or a lipase enzyme (Lipolase-100T) either separately or successively. Then the enzyme(s) treated fabrics were treated with different finishing chemicals in individual form as well as in combination form. The finished and unfinished fabrics with and without prior enzyme treatment(s) were evaluated for their performance properties.

The cellulase enzyme treatment influences the aesthetic properties of union fabric in warp direction, while protease enzyme treatment in weft direction, which attributed that enzyme influenced their corresponding fibre properties specifically and their successive applications influence the whole fabric properties. The softness and handle of enzyme treated and finished fabrics are better than finished-only fabrics and enzyme treated fabrics. The combination of a micro silicone emulsion with a cationic softener shows better softening effect than other finishing combination on wool/cotton union fabric. The wicking properties of the Sandoperm-RPU/Ceraperm-Aqua/their combination finished wool/cotton union fabric are better than other combination finished fabrics. The Synthappret-BAP+Ceraperm-CW combination finishing on Savinase treated wool/cotton materials shows very good shrink resistance and total hand value. The β -cyclodextrin based combination finishing on cellulase enzyme treated wool/cotton union fabric shows moderate shrink-resistance and total hand value with good antimicrobial effect.

All enzyme treatments reduce the tearing strength of wool/cotton union fabric, while all subsequent finishing treatments retain its original or even higher value except in Finish-VLF based finishing. Among the protease enzymes, Savinase 16.0L-Ex treatment with and without successive Bactosol-CA enzyme treatment and subsequent Ceraperm-MW based finishing treatment shows better aesthetic properties in terms of softness and handle on wool/cotton union fabric. So there is a great possibility to develop innovative fabrics by blending the chemically treated wool or Angora rabbit hair with cotton, viscose rayon, polyester and acrylic. The application of the above mentioned chemical treatment(s) on these fabrics improve their aesthetic properties such as softness and handle and also their functional properties, which fetches more value for finished woolen materials.