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# PRODUCTION AND PERFORMANCE OF ANGORA RABBIT HAIR- BHARAT MERINO WOOL BLENDED SHAWLS

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## ABSTRACT

Angora rabbit hair was mixed with Bharat Merino wool in three different proportions viz. 28:72, 40:60 and 60:40, at the carding stage using modified cotton card. The blends were then processed to prepare yarn using semi worsted spinning system. During spinning, it was observed that rabbit hair could be blended up to 60% without any difficulties. The developed yarns were used to produce shawl fabric using powerloom, followed by dyeing with reactive dye and finishing with cationic softener. The performance of the shawls showed that softness and thermal insulation of the shawls was increased with the increase in the proportion of Angora rabbit hair from 28 to 60%. The abrasion loss was also less when the rabbit hair proportion was increased in the shawls. **(Indian Journal of Small Ruminants 2011, 17(1): 79-82)**

**Key words**: Angora Rabbit, Bharat Merino, Rabbit hair, Shawls, Sheep, Softness, Thermal insulation, Wool

Angora rabbit hair products are always in high demand due to their special attributes like high thermal insulation and superior softness with light weight. However, there are some limitations associated with Angora rabbit hair like limited production, high cost and laborious hand spinning process (Gupta et al., 1992). Angora rabbit hair could not be spun in machine due to its typical scale structure, which results in poor inter-fibre cohesion. Angora hair has 4-5 times less coherence than wool. Angora wool also generates high static charges during processing. These problems cause frequent lapping of fibres in the machines which makes spinning difficult (Gupta et al., 2002). Hence, Angora hair is always mixed with sheep wool and other fibres in different proportions for machine spinning. Among the different blends, the Angora hair- wool blend is widely used for producing fine wool products due to their identical chemical and physical nature. The above blended materials are suitable for winter fabrics like shawls, sweaters etc.

In India, Angora wool production is well established in the Kullu region of Himachal Pradesh. Presently, Angora rabbit hair is blended with imported Australian Merino wool in different proportions to spin the yarn in machine and good quality shawls are manufactured. However, there is no detailed study about the optimum proportion of Angora hair and sheep wool in the blend in terms of performance properties like spinnabality, softness, thermal insulation etc. Similarly, there is no detailed study about the use of indigenous fine wool like Bharat Merino sheep wool for such purposes. Hence in this study, an attempt has been made to develop shawls with Angora hair and indigenous Bharat Merino wool blends and to study their performance properties.

## MATERIALS AND METHODS

Bharat Merino wool from Southern Regional Research Centre of Central Sheep and Wool Research Institute (CSWRI), Mannavanur having 22μ diameter, 40-50 mm staple length

and Angora rabbit hair from North Temperate Research Station of CSWRI, Garsa having 12μ diameter and 60 mm staple length were used for this study. Rabbit hair (RH) was blended with Bharat Merino (BM) wool in three different proportions i.e. 28:72, 40:60 and 60:40 at carding stage using modified cotton card at slow speed to avoid breakage of fibres and produce homogeneous blend. Antistatic agents were not used during carding stage. The blends were then spun into yarn on semi worsted system using gill box, roving frame and worsted ring frame. All the three blended yarns were then used to prepare the shawls using wool-polyester (60:40) blended yarn (2/70 Nm, 8.54 g/tex tenacity, 10% extension and 177 tpm) as warp in 3/1 twill weave pattern on powerloom.

The shawls were scoured using 0.5% non ionic detergent on Dolly machine followed by bleaching with hydrogen peroxide on winch machine. The receipe used was comprised of hydrogen peroxide (2 gpl), non-ionic detergent (0.25 gpl), sodium carbonate (0.5 gpl) and trisodium phosphate (1gpl). Temperature was 60°C for 60 min and the liquor ratio was 1:50 at pH of 8-9. After bleaching the shawls were treated with Leucophor WO (0.25%) at 40°C and pH 4 for 15 min to enhance the whiteness. The CIE whiteness index of both bleached and Leucophor treated shawls was evaluated in Jaypak computer colour matching system.The shawls were dyed with Drimarine Blue RLI reactive dye in two different shades viz. 1% and 2% to study their dyeing behaviour. The colour coordinate values of the dyed samples were determined using Jaypak computer colour matching system.

The shawls were then given finishing treatment with cationic softening agent (Silligen F of BASF) on winch machine using the receipe comprosed of cationic softener (2gpl) at conditions of pH 5, 40 °C temperature for 30 min. The shawls were then passed through stentering machine at 120 °C and decatizing machine (saturated steam for 2 min) to set the dimensions of the fabrics. The produced shawls were then tested for their bending and frictional properties using bending length tester and Instron respectively. The thermal conductivity of the shawls was tested using SASMIRA thermal conductivity tester under steady state condition. The abrasion loss of the samples was tested using abrasion tester (WIRA, England).

## RESULTS AND DISCUSSION

During spinning of rabbit hair- wool blends, it was observed that rabbit hair could be blended up to 60% without any difficulties in spinning. The physical properties of all the 3 blended yarns wool have been depicted in Table 1. The results showed that the fineness, tenacity and elongation of the yarns were increased with the increase in the proportion of rabbit hair. This might have been due to the better cohesion between rabbit hair and Bharat merino wool up to the proportion of 60:40.

Table 1.Physical properties of Angora hair-Bharat Merino wool blended yarns

| Properties | RH:BM - 28:72 | RH:BM - 40:60 | RH:BM - 60:40 |
|---|---|---|---|
| Yarn fineness (Nm) | 2/35 | 2/44 | 2/48 |
| Yarn Twist (tpm) | 88 | 100 | 98 |
| Tenacity (g/tex) | 5.91 | 7.93 | 8.06 |
| Elongation (%) | 21.78 | 22.24 | 27.6 |

The constructional properties of all the three developed shawls have been depicted in Table 2. The results showed that with the increase in the proportion of rabbit hair content in the yarn, the strength of shawl fabric was decreased while the elongation was increased.

The whiteness index of the shawls with hydrogen peroxide bleaching and hydrogen peroxide bleaching followed by Leucophor WO treatment have been depicted in Table 3. The results showed that the presence of Bharat Merino wool which is creamy white in colour

affected the whiteness index of the shawls. The whiteness index of the shawl decreased with the increase in the proportion of Bharat Merino wool in the blend. The similar trend was observed when the blended fabrics were bleached with hydrogen peroxide. In order to get better whiteness, the fabrics were treated with 0.25% Leucophor W (Optical Brightening agent), which provided the required whiteness to the developed shawls.

Table 2. Constructional properties of Angora hair-Bharat Merino wool blended shawls

| Properties | RH:BM - 28:72 | RH:BM - 40:60 | RH:BM - 60:40 |
|---|---|---|---|
| Ends/inch | 44 | 44 | 44 |
| Picks/inch | 36 | 36 | 36 |
| Weight (g/sq. m) | 170 | 158 | 142 |
| Thickness(mm) | 0.523 | 0.513 | 0.482 |
| Strength (kg) | 13.86 | 12.96 | 10.2 |
| Elongation (%) | 51.50 | 62.35 | 51.45 |

Table 3. Whiteness index of Angora hair-Bharat Merino wool blended shawls

| Blends | Type of bleaching | | |
|---|---|---|---|
| | Without bleaching | Only $H_2O_2$ bleaching | $H_2O_2$ bleaching + Leucophore WO treatment |
| RH:BM - 28:72 | 15.2 | 20.0 | 33.6 |
| RH:BM - 40:60 | 18.5 | 24.2 | 36.5 |
| RH:BM - 60:40 | 19.8 | 28.5 | 38.6 |

The colours coordinate values of all the three dyed shawls have been depicted in Table 4. The result indicates that the dye uptake was increased when the rabbit hair proportion was increased from 28 to 60%. The RH: BM (60:40) shawl was 6% darker than the other shawls.

The performance properties of the shawls have been depicted in Table 5. The bending length and frictional force which are the measures of softness showed that RH:BM (60:40) had higher softness compared to other two fabrics. Softness of the shawls was increased with the increase in the proportion of rabbit hair. The abrasion loss % was also less when the rabbit hair proportion was increased from 28 to 60%. The thermal insulation value (Tog) was higher for RH:BM (60:40) shawl by 15% and 9% compared to RH:BM (28:72) and RH:BM (40:60) shawls, respectively. As the amount of Angora fibre proportion increased, the thermal insulation also increased. This could be explained with the structure of blended yarns. Angora is a medulated fibre and imparts hairiness to the yarn. These hairs encapsulate air between the entangled fibres and fabric surface and the trapped air has lower thermal conductivity than the fibres. This resulted in improved thermal insulation (Nida et al., 2009; Pac et al., 2001).

Table 4. Colour coordinates of Angora hair-Bharat Merino wool blended shawls

| Colour coordinate value | Shade (%) | RH:BM - 28:72 | RH:BM - 40:60 | RH:BM - 60:40 |
|---|---|---|---|---|
| L | 1 | 61.82 | 62.55 | 63.13 |
| | 2 | 56.23 | 56.06 | 58.28 |
| a | 1 | -6.53 | -6.41 | -5.87 |
| | 2 | -5.97 | -5.63 | -5.71 |
| B | 1 | -11.72 | -12.42 | -14.07 |
| | 2 | -15.75 | -15.12 | -16.18 |

Table 5. The performance properties of Angora hair-Bharat Merino wool blended shawls

| Properties | RH:BM - 28:72 | | RH:BM - 40:60 | | RH:BM - 60:40 | |
|---|---|---|---|---|---|---|
| | Warp | Weft | Warp | Weft | Warp | Weft |
| Bending Length (cm) | 1.67 | 1.7 | 1.63 | 1.65 | 1.61 | 1.49 |
| Frictional force (g) | 199 | 204 | 197 | 199 | 195 | 197 |
| Abrasion Loss (%) | 5.4 | | 3.4 | | 3.6 | |
| Thermal Insulation(Tog) | 1.476 | | 1.56 | | 1.704 | |

In conclusion, the results indicated that the rabbit hair can be blended up to 60% with Bharat Merino wool to produce fine quality yarn suitable for producing shawl type fabrics. The proportion of rabbit hair positively influenced the fineness, strength and elongation % of yarns. Similarly, the rabbit hair proportion influenced the dye uptake, softness and thermal insulation of the shawl. The shawl fabric with 60% rabbit hair proportion had higher thermal insulation value, compared to other two fabrics.

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