CAMEL HAIR – PRODUCTION, QUALITY AND PROSPECTS

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Although hair production character in single humped camel (*Camelus dromedarius*) is of secondary importance when compared to its primary utility of draught and agriculture activities under north west hot arid region of India, where as in other north east African and Arab countries having two third of world camel population the primary utility of camels is meat and milk production. Although conventional uses of hair in village cottage industry since long was for preparation of traditional items viz.; Coarse blankets, bags, small daries and Bhaklas by camel rearing communities. Camel hair is comparatively warmer than wool but less remunerative. It belongs to group of specialty fibers which are known for softness, warmth and natural colour. In recent years camel hair blends with cotton, wool, silk waste and other fibers have shown goods prospects but there is no organized marketing system (Sahani *et.al.*, 1996).

As per the existing trend clipping of hair is done annually by traditional clippers during the month of March/April. The main hair coverage sites are neck, shoulders, mid side and hump region. Hair production of indigenous dromedary camels shows large colour variation ranging from light brown in Jaisalmeri camels to brown/dark brown and blackish brown in Kachchhi and Bikaneri breeds. Clipping of hair provides comfort to the animal and is also beneficial from health point of view. Some of the professional camel keepers clip their camels in traditional style based on local art and culture designs. Hair of dromedary camels are coarse, durable, strong having low conductivity Mukasa (1981).

Products of camel hair

PHYSICAL PROPERTIES

Camel hair fiber is rather strong almost equal to wool of the same fineness. The moisture regain content at 65 relative humidity and at 70° F temperature is around 15 percent (Patni and Dhillon 1988).

CHEMICAL PROPERTIES

Raw camel hair contains about 15 - 35% sand, dust and dirt and very small 0.5 - 1 % wool wax. The sulphur content is 3.5 percent (Patni & Dhillon, 1988).

SPINNING & GRADING

The spinning is mostly performed by family members of camel rearing communities. The coarse hair is spun in traditional manner using "Hand Dhayaria" by male family members of Raika and Rabaries families whereas the fine quality hair obtained from one year age calves is spun by women by "Hand Charkhas". For optimum & economic utilization of hair and its products the fiber should be graded based on colour. Calf and adult camel hair should be processed separately in view of quality difference.

HAIR COAT AND STRUCTURE

Camel possesses thick hair coat with hair follicles arranged in compound clusters. Each compound follicle is associated with sebaceous glands and a tubular sweat gland situated deep in dermis. Sweat gland is connected to the neck of follicle via long tubular canal. The density of glands is sparse in comparison to other species, as sweating is probably not an important mechanism for controlling body temperature in camel. The deep dermal location of sweat gland is thought to minimise deep evaporative water losses from skin and in addition the long ductular segment may help for significant fluid resorption from sweat during time of water deprivation. Another important feature of camel skin are poll glands which are most prominent in adult males and are in most active phase during rut and these consist of aggregates of tubuloacinar glands located bilaterally on the poll of head. The secretion from these is greasy,

pigmented in appearance and offers penetrating odour. In castrated and entire males out of season the glands are atrophic (Manefield and Tinson, 1997). The microscopic structure of hair fibers are wool like consisting of epidermis and cortical layers having medulla. The epidermal scales are faintly visible because of presence of pigments in cortical layer (Patni & Dhillon 1988)

HAIR PRODUCTION

1. Single humped (*Camelus dromedaries*)

The hair obtained from dromedary camel in India are coarse as compared to bacterian camel. Annual hair production from important indigenous camel breeds (Bikaneri, Jaisalmeri and Kachchhi) over the years indicated clear cut superiority of Bikaneri camels with mean production of 0.967 ± 0.017 kg followed by Jaisalmeri camels 0.733 ± 0.01 kg and Kachchi 0.624 ± 0.01 kg with a overall production of 0.778 ± 0.11 kg. Similar trend was also observed by Sahani *et al* (1998). Breed and sex difference was significant. Among different age groups hair production was found to be heavier at 3 to 4 years of age and there after showing declining trend with advancement of age. The age difference was found to be non significant after 7 years of age. Hair production in males is 20% to 30% heavier than the females in all the breeds. The skin coat of 1 to 3 years of age was more soft as compared to adult. Year wise pooled hair annual production from 1998 to 2002 reflect significant ($P < 0.01$) higher production in Bikaneri 0.939 ± 0.01 kg followed Jaisalmeri 0.746 ± 0.01 kg and Kachchhi 0.648 ± 0.02 kg Bhakat *et al.* (2003).

2. Double humped Camel (*Camelus bacterianus*)

Hair is important production trait in double humped camel as compared to single humped camel and is used for manufacture of items viz.; shawls, coats, sweaters, hand gloves and caps etc. The bacterian camel hair is comparatively fine, soft and elastic with good insulation property. The crimp are generally irregular and the diameter of individual fiber is uneven (Indian Broucher Double Humped Camel NRCC, Bikaner 2001). The annual hair production of double humped

camel habitat in Nubra Valley of Ladakh (Jammu & Kashmir) India ranges from 3.0 to 4.0 kg/head which is quite low when compared the double humped camel of Mangolia, China producing around 6.0 to 7.0 kg per annum. The number of wool fibers per square centimeter of skin of camel in good physical condition varies from 4200-4500.

The camelidae living in high altitude regions of peru, Bolivia and Argentina posses wool of excellent quality (Bustanza 1979). The wool from vaccuna is highly priced.

HAIR QUALITY ATTRIBUTES

In general it was evident that fiber length increases with coarseness. The vegetable matter content of camel hair ranges between 4 to 4.5% and the initial pH of hair is around 7.2 (Patni & Dhillon 1988).

1. Staple Length

Comparison of staple length among single humped indigenous camel breeds indicates that Bikaneri camel's posses longer staple length 6.68 ± 0.21 cms followed by Jaisalmeri 6.16 ± 0.24 cms and Kachchhi 4.65 ± 0.42 cms. Contribution of breed, body site and age effects were significant ($P < 0.01$) and sex effect was also significant ($P < 0.05$). Among various body sites hump region has maximum staple length 10.14 ± 0.3 cms followed by shoulder 4.87 ± 0.3 cms mid site 4.41 ± 0.30 cms and neck having lowest length 3.90 ± 0.30 cms and the overall staple length varies from 0.583 ± 0.17 to 6.05 ± 0.23 cms, Bhakat et al, (2001).

Age group wise trend indicated higher fibre length at 3 to 4 years age 6.49 ± 0.27 cms followed by yearling camel calves 5.47 ± 0.28 cms and decreasing trend with advancement of age. Staple length was minimum at 8 years of age and above was 5.54 ± 0.26 cms. Similar finding have also been reported by Banmali Y. *et al.* (2000). The higher staple length is one of the factor contributing to higher hair production in Bikaneri as compared to other two breeds.

2. Fiber Diameter

Mean hair diameter in three indigenous camels Bikaneri, Jaisalmeri and Kachchhi was found to be 32.76 ± 0.52 cms, 35.52 ± 0.59 cms and 38.19 ± 1.07 cms respectively. Bikaneri having comparatively fine hair followed by Jaisalmeri and Kachchhi and contribution of breed was significant ($P < 0.01$). Gupta et al (1989) reported large variability in mean fibre diameter varying from 26.0 micron to 38.0 micron with significant contribution of breed, sex and age effects ($P < 0.01$).

Age wise comparison of fiber diameter was significant ($P < 0.01$) and the hair from one year of age calves in all the breeds was fine with average of (26.05 ± 0.72) micron and hair quality becomes coarse with advancement of age, at 4 years age the diameter was 31.72 ± 0.68 micron and at 8 years and above 48.70 ± 0.66 microns. The fibre diameter of pure type camel hair in 3 breeds of camel varied from 24.01 ± 0.47 to 33.41 ± 0.97 microns, hetero hair from 31.13 ± 0.54 to 38.76 ± 1.1 microns and hairy from 42.5 ± 0.74 micron to 50.24 ± 1.5 micron. Bikaneri camels posses higher percentage of pure hair, the overall percentage of pure, hetero, hairy and kempy hair in all the indigenous breeds is around 37.8%, 40.0%, 19.7% and 2.1% respectively, Bhakat et al, (2001).

Quality evaluation among body sites indicated that mid site posses comparatively more finer hair with diameter of 32.98 ± 0.76 micron followed by shoulder (34.99 ± 0.76 micron) and neck (35.48 ± 0.77 micron), where as hump having more coarser hair with average diameter 39.02 ± 0.77 micron. Similar trend has been reported by Sahani et al (1998).

Yearling calves have maximum number of pure fibres 45.7 percent and then decreasing trend with advancement of age at 4 years of age 38.98% and at 8 years around 28.9 % respectively. Further percentage of pure fiber was higher at mid site 39.0% followed by as neck region having 37.8% and hump 36.8%.

Hetro fibers in different age groups varied from 35.20% at 1 year of age to 43.86% at 8 years of age and above. Similar trend was noticed

for hairy fibres ranging from 16.46% to 24.68% and kempy fibres varied from 1.40% to 2.60%. Breed and age factor contributed significantly ($P < 0.01$).

Double humped Camel (*Camelus bactrianus*) - The staple length is highest (16.13 cm) at the hump region of camel calves while staple length at shoulder and mid side were 10.8 and 5.0 cm respectively in adults. The mean fiber diameter in calves varies between 18.42 to 25.82 micron while in adult from 26.16 to 44.34 micron. Mid side region fibers are finer both in calves (18.42 micron) and adults (26.16 micron) as compared to hump region (25.82 micron for calves and 44.34 micron in adults).

The hair production in males is about 30% higher than that of the females. The quality of the hair of the young camel is finer as compared to adult camel. The fiber diameter of pure fibers among three different sites of calves varied from 14.69 micron to 20.07 micron, hetero fibers from 20.74 micron to 27.61 micron and hairy 31.51 micron to 55.19 micron, while in adult pure fiber diameter varies from 21.00 micron to 33.59 micron, hetero 30.31 micron to 47.04 micron and diameter of hairy fiber varied from 47.27 micron to 67.87 micron.

Evaluation of the mean fiber diameter and fiber strength of calves from different body sites does not differ much yet there is difference in the elongation percent values. The fibers from mid side region have much high elongation percentage 38.30% as compared to 15.89% of those from the hump region at the same gauge length i.e. 50 mm indicating that fiber from mid side region are more suitable to be used for textile purpose as blends with wool and other fibers. In case of adult camel the mean fiber diameter values show more variance in hump and shoulder region than the mid-side region. However, the fiber fineness trend is same i.e. the mid side region fibers have the highest fineness 30.40 micron in comparison to 45.84 micron and 47.04 micron of shoulder and hump region respectively. As far as the elongation percent property is concerned higher elongation percent value has been observed in shoulder and hump regions. It shows that in adult camel too the mid side region fibers not only possess lowest mean fiber diameter, highest fiber strength but also comparable in elongation percent with the fibers

of other regions.

Blending prospects - Camel hair production being limited like other speciality fibers, it was considered worth while to blend it with polyester, wool, silk waste and polyester filament yarn waste in small quantities to produce special effects, beauty, lusture and softness. The comparison of tenacity values of different grades of camel hair with other experimental fibers reveals that camel hair is stronger than wool. The loss in tenacity in wet state is less in black and white spotted grade as compared to finer grades of light brown colour. It was observed that camel hair blends with wool blended silvers of 40/60 and 60/40 proportions exhibit the maximum silver strength and elongation though twist in blend is nearly absent. The tenacity value of camel hair blended with polyester staple fibers and silk waste is much higher as compared to camel hair and its blended yarn with wool. However the elongation percent value of camel hair wool blended yarn are comparable to these yarns. In general all blended yarns are comparable with wool yarn and stronger having more protruding fibers on yarn surface. This proves the suitability of the use of camel hair as a blended yarn. Pure camel hair fabrics are slightly inferior to blended ones, justifying the use of this fabric as a blend.

Blends made up of calf camel hair

Coarse camel hair can be blended with cheaper synthetics and wool to produce hair belting yarn, which can be used as filters for filtering of oil and as insulating material and for other industrial uses.

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