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Common factors that affect the quality of wool harvest from sheep

Virender Pathak and Rajesh Rajput

Deptt. Of Veterinary Anatomy and Histology DGCN, COVAS, CSK HPKV, Palampur-176062

Corresponding author: pathakv26@yahoo.com

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INTRODUCTION

Sheep has nature's gift to provide natural fiber the wool. Wool provides more warmth, comfort, and flame retardancy therefore wool is being used for manufacturing premium apparel, carpets, and upholstery since the early civilization of our society. With the change of time, synthetic fibres dominated the natural fibres because of the cheaper price and high production rates. However, wool is still an important basis of textile industries, especially in the decentralized sector. Wool harvest and processing have remained a livelihood source for many families since their generations. In India the total wool sector gives employment to more than 15 million people out of whom nearly 5.8 million are involved in the wool processing sector, 2 million families in sheep rearing, and the remaining are in wool traders and merchants. In the wool sector, mostly full family members are associated with wool production and allied activities. Australia, China, United States, and New Zealand are the world's leading producers of wool.

India ranks 3rd after Australia and China in sheep population with 65.06 million sheep heads, however, among wool-producing countries, India ranks 9th due to lower wool productivity (0.9 kg/sheep/year) as compared to the world average of 2.4 kg/sheep/year. India accounts for approximately 2% of global wool production. However, the rise in wool production is expected in near future as a consequence of sustainability awareness and steps towards mitigation of climate change impact. Rajasthan (33%), J & K (18%), Karnataka (10%), Telangana, and Andhra Pradesh (13%) are major wool-producing states/union territory. These states contribute about 75% of the total wool produced in the country. The rest of the wool is produced by other states i.e., Himachal Pradesh, Uttarakhand, Madhya Pradesh, Maharashtra.

The wool produced all over the world can be broadly grouped into three grades: fine, medium, and coarse. The wool below 25 μ m in diameter is a fine wool that is used

for the manufacturing of apparel. The medium wool having 25–35 μm diameters are suitable for carpets. The coarse wool, considered as waste, has more than 35 μm fibre diameter. Indian wool is almost exclusively of broader micron and used in the manufacturing of carpets and rugs. Out of produced wool in the country, the highest (60-80%) is carpet grade wool followed by coarse wool (20-40%) and fine apparel grade wool (5-10%). The fine wool produced in India is processed on the semi-worsted spinning system in the decentralized sector for shawl manufacturing. India is exporting woollen items (Handmade carpets, RMG, Fabric) worth Rs.11484.82 crore (2017-18) including carpets (Rs.9196.99 crore). Wool production is not sufficient to meet the demand of industry hence India has to import raw wool. India has imported 79.95 million kg raw wool (2017-18), both apparel and carpet grade, worth Rs. 1884.59 crore. (Annual Report, MOT, 2017-18).

Apart from meat, wool can also contribute in sustainability of income to farmers in India. There are some common managerial factors other than using high genetically improved breeds to get good harvest of wool from our native sheep breeds. The common factors are:

NUTRITION

Over the past decade's nutrition research on wool production primarily focused on wool growth with less attention paid to physical quality traits of wool. Generally, for most sheep, as they increase in age, they also increase in liveweight by the process of growth. At any point in time however seasonal changes in nutrition can cause liveweight loss during periods of low pasture digestibility and availability and liveweight gain with the return of pastures with high digestibility. Thus, it is not possible to separate the effects of nutrition on wool growth and quality from the effects of nutrition on the liveweight of sheep. As the sheep increase in age fibre diameter increases and staple length decreases. Therefore, changes in fibre diameter should be expected from any seasonal variation in pasture quality, variations in stocking rate and physiological factors such as pregnancy and lactation. The fibre diameter is proportional to the fleece free weight of the animal. Fibre diameter become more uniform as animals approach their mature size, The effects on wool growth attributed to Vitamins A and D are likely to be associated with changes in fibre length, fibre diameter and cuticle size but have not been quantified. Wool staple length is phenotypically positively related to liveweight.

HEALTH

The health of any production animal has a significant effect on the quantity and/or quality of the product that is produced. Wool is no exception, with a variety of health conditions impacting on the amount produced in addition to properties of the wool. some of the more common sheep maladies that effect wool qualities are as follows:

Gastro-intestinal parasites : Nematode infection decreases clean fleece weight and fiber diameter. It has been seen that reduced worm burden following increased

frequency of anthelmintic treatment results in an increase in fleece weight and fiber diameter. The effect of roundworms on other wool attributes is less clear, with studies reporting increased frequency of anthelmintic treatments increases staple length and staple strength. Clearly, it is in the best interests of wool producers to minimize gastro-intestinal parasitism, but with increasing resistance to anthelmintics it may be worth considering other strategies for minimizing gastro-intestinal parasitism such as mixed-grazing with other species, using rotational grazing methods and the use of genetic selection for resistance and/or resilience.

Lice : Lice can have a negative effect on wool quality with such effects amplified as the number of lice present and the duration of infestation increases. Staple length appears to be slightly reduced by louse infestation although some studies report no effect. The effect of louse infestation on staple strength remains less clear.

Fleece rot and foot rot Fleece : Fleece rot is a superficial dermatitis caused by prolonged wet-ting of the skin and the multiplication of bacteria. Foot rot leads to lameness in sheep and reduces both the liveweight of sheep, it grows less wool.

Fly : There is little information about the impact of fly on wool growth and quality. Most information demonstrates that wool from fly-struck areas has lower staple strength than wool from adjacent non struck areas. It is likely that stress plays a role in causing 'tender fleeces' of struck sheep, with high ACTH and cortisol levels found in sheep suffering from fly menace and other studies demonstrating administration of these hormones can cause 'break in the fleece. For affected animals some wool is lost if the infected areas are shorn.

REPRODUCTION

Pregnancy and lactation can have significant effects of the quantity and quality of wool produced. The effects of pregnancy and lactation on wool production is because of the division of nutrition between maintenance of body and wool growth, reproduction causes nutrients to be directed toward growth and support of the foetus or feeding of the lamb. As a result, while dry matter intake increases during pregnancy and lactation, the efficiency with which dry matter is turned into wool decreases. Fibre diameter tends to decrease along with reduced wool growth.

Weight of ewe and nutrition at pregnancy upon progeny : In foetal life primary wool follicles starts development at approximately day 60 of gestation while secondary follicles start development around day 80 and begin to branch from day 100 through to early post-natal life. It has been known for many years that the skin secondary follicle population of sheep is affected by the nutrition of the ewe during pregnancy and the first months of lactation. progeny of heavier ewes at mating produces finer wool. Ewes which gained weight during pregnancy produce progeny with finer wool. Similarly, better fed lambs, as in single reared compared with twin reared lambs, produce coarser wool at 5 months of age. Single born progeny always produced the finest wool up to 39

months of age and twin born and twin reared progeny always produced the coarsest wool.

Effect of sex : female lambs always produced coarser wool compared with male lambs.

MANAGEMENT

Frequency of shearing : The impact of the frequency of shearing (fibre harvest) on fibre production and quality has been studied in a limited number of fleece bearing breeds. These studies indicate that increasing the frequency of shearing increases wool production. In some sheep breeds an extra winter or summer shearing, i.e. two shearings per year, compared with an annual shearing resulted in an extra 10% of clean wool growth, associated with a 5.6–9.8% increase in staple length. The reasons for increased fibre production and changes in quality attributes with increased frequency of shearing are poorly understood. The following factors are likely to be relevant: Shearing stimulates a cold stress response, increasing the metabolic rate by up to 30% in sheep. •Shearing stimulates increased feed intake for about five months.

Time of shearing : The choice of when to shear is one of the major decisions a wool producer has to make and can impact on a variety of fleece attributes. In a spring-lambing flock in south-eastern Australia, December shorn ewes produced slightly, but significantly, lighter and finer fleeces than did March shorn or May shorn ewes, though the latter displayed significantly broader fibre diameter. Time of shearing did not affect staple strength. Ewes shorn during pregnancy have given birth to lambs with lower skin follicle densities, compared with lambs born to ewes not shorn until after lambing.

Coats : Research with fine wool Merino sheep has shown that the amount of wool harvested at shearing can be 10–15% less than the amount actually grown. Weathering as a result of UV light damages the tips of the wool staple which are weakened and then lost by abrasion. Sheep coats have been shown to protect wool against UV light damage, dust and contamination

Housing : There is little information in the literature regarding the effects of housing on the quality of wool.

It is suggested that if government can work on pasture development, genetics projects and employ more scientists for the research on quality production of wool. The farmers can have an extra source of income from livestock

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