

Sustainable Control of Ectoparasites in Small Ruminants

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Introduction

Small ruminants represent an important segment of livestock in Jammu and Kashmir. The state of Jammu and Kashmir has excellent atmosphere for its agro-climatic and geo-physical condition and is blessed with land, environment and socio-cultural setup uniquely appropriate for production of small ruminant production. Rearing of sheep and goat is the primary occupational source for Bakerwals, Chopans, Gaddies and rural masses of plain belts of Jammu and important sources of rural economy (Kumar *et al.*, 2012). Despite having huge numbers of livestock, the production potentials are very low. So many factors are related to production losses and among them ectoparasitic problem plays an important role in huge economic losses directly or indirectly to the farmers by reducing milk, wool and meat production along with retarded growth. Ectoparasites are cosmopolitan in distribution, extremely harmful and in utmost circumstances cannot be destroyed forever. Impact of their infestation results in retardation of growth and exploitation of animal resource (Byford *et al.*, 1992) and cause huge livestock production loss (Soulsbly, 1982). Most common ectoparasites that causes loss to the small ruminants are tick, lice, ked, mange mite, dipteran fly larvae (Mullen and Durden, 2002) because they causes disease transmission, blood sucking, damage to the hide and wool. They cause intense irritation depending upon the intensity of infection and moreover indirectly they are the vector of protozoal, bacterial, viral and rickettsial disease. Direct losses due to ectoparasite infestation are discomfort to the animals which causes drop in production and growth rate. Ticks, blowflies, sheep keds and mites cause direct damage to hides and wool or damage resulting from rubbing and scratching due to pruritis. Skin diseases caused by ectoparasites in small ruminants were known causes great economic losses to the farmers as well as tanning industry (Tefera and Abebe, 2006b). Due to global warming and climatic changes, ectoparasites incidences are increasing now a days

(Kabir *et al.*, 2011). Ectoparasites are also responsible for down grading and pre slaughter skin defects, which lead to rejection of small ruminant skins (Mersha, 2013).

Major Ectoparasites of small ruminants:

Sheep keds (*Melophagus ovinus*):

Melophagus ovinus, or the sheep ked, is a brown, hairy fly that resembles a tick and is an obligate ectoparasite. This wingless fly is about 4 to 6 mm long and has a small head, is a fly from the family Hippoboscidae. They suck blood of sheep (Maa, 1969). Goats are also affected by this ked. This ectoparasite lives for whole life lives in sheep wool. In lambs the sheep ked may cause anemia and reduce weight gain. The sheep ked feeds on the blood of its host and therefore causes irritation to the sheep, leading it to rub, producing both loss and damage of the wool. The ked feces also stain the sheep's wool reducing its value. They also transmit *Trypanosoma melophagium*, non pathogenic protozoan parasite of sheep (Soulsby, 1982). It also transmit blue tongue virus. *M. ovinus* infestation does not produce any marked changes in the health of sheep. Irritation due to biting by ked in animal and rubbing causes resultant damage to the fleece and developments of a vertical ridging of skin called 'cockle'(Kettle, 1984).

Control of sheep ked: Shearing removes a majority of the keds and followed by use of an appropriate pesticide helps in eradication if the entire flock or herd is treated. Commonly in spring, sheep should be treated after shearing with an insecticide which is effective. Treating an animal with insecticides consist of whole body sprays, dusts and dips, as well as pour-on. Pyrethroids have been found to be effective against sheep keds.

Tick infestation

Ticks are one of the most serious ectoparasites of small ruminants. Ticks infestation mostly transmits tick borne diseases protozoal infection like Theileriosis, Babesiosis and Anaplasomosis. Other disease also transmitted through infection of skin diseases such as looping ill by *Ixodes ricinus*, African swine fever, Q-fever, (Wall and Shearer, 2001). Heavy infestation of tick can causes anaemia. Some species of tick can cause tick paralysis and other some species may causes tick toxicosis. High humidity is favourable for maintenance of tick population. Different species of tick mostly found in sheep and goats are *Rhipicephalus appendiculatus*, *R. evertsi*, *Ixodes ricinundus*, *Boophilus decoloratus* and many more.

Control of Ticks: Control of ticks mainly done by dipping animals by using recommended acaricides. Rotational grazing as well as burning of heavily infested pasture is also practised to control of ticks population. Ploughing of grazing land also allow to exposure of different developmental stages of ticks to sunlight and buries them in deep soil layer also help in reducing the population. If the intensity of infestation is less, then manual removal of ticks can be done.

Mange Infestation

Mange is a highly contagious disease caused by different types of mites transmitted through direct and indirect contact (Kassa, 2005). The mange mite that mostly affects the small ruminants are *Sarcoptes scabiei*, *Psoroptes caprae*, *P.cuniculi*, *P.communis*, *Chorioptes* spp., *Demodex* spp. and rarely *Notoedres cati*. Affected animals are remaining as sources of infection. Mode of transmission of mange infection is direct contact through skin or any other infected sources. Overcrowding of animals help in transmission of disease. Young animal like kids and lambs are more severely affected than adults. Mite infestation causes retarded growth rate, loss of body weight, reduce daily weight gain, milk and meat production also reduced and also reduces economic values of skin and hide (Rahbari *et al.*, 2009). Moreover some species are having zoonotic importance that transmits infection to human being (Wall and Shearer, 1997). Sarcoptic mites pierce the skin and suck lymph and feed on epidermal cell and thereby causing intense irritation. Skin is thickened and wrinkled. Psoroptic mite is a non burrowing mite, puncture the epidermis and suck lymph and skin become wrinkled like sarcoptic mange infestation. *Psoroptes* mite in sheep is highly contagious which causes intense irritation, rubbing of the body and restlessness. Vesicles and papules are formed and exudates coming out from papules results in crust formation and matting of wool. Finally there may be alopecia. Chorioptic mange also causes intense erythema, itching, rubbing and folding of skin in sheep and goat. Diagnosis of mange mite infestation is done by deep skin scraping examination in 10% KOH/NaOH, which should be boiled for 5-10minute, then centrifuge the materials at 1500 rpm for 15 minute. Presence of mite can be detected by examining a drop of sediment and morphological identification will be done by standard protocol (Soulsby, 1982).

Control of mange mite: Avoidance of overcrowding and hygiene in animal houses will prevent the spread of mite infestation. Sarcoptic mange can be treated with Ivermectin

(0.2mg/kg), 0.05% diazinone and 0.05% coumaphos. Two application of phoxim (0.05%) at 10 days interval is effective for Chorioptic mange infection. People may occasionally become infected with *Sarcoptes scabiei* of animal origin (Arlian, 1989a).

Lice and flea infestation

Lice and flea infestation causes severe anaemia to small ruminants. Heavy infestation causes losses to the leather industry. Animals may be recognized by their dull, matted coat or excessive scratching and grooming behaviour. Sucking lice suck blood by piercing the skin. Biting lice have chewing mouthparts and feed on particles of hair, scab and skin exudations. Due to intense irritation from louse causes animals to rub and scratch, causing raw areas on the skin or loss of hair. Weight loss as well as milk production is reduced about 25 percent (Kaufman *et al.*, 1993) Also, the host is often listless and in severe cases the loss of blood to sucking lice can lead to anaemia. Peak infestation of lice is seen in late winter and early spring. Lice are generally transmitted from one animal to another by contact. Transmission from herd to herd is usually accomplished by transportation of infested animals, although some lice may move from place to place by clinging to flies (phoresy). Lice are most often introduced to herds by bringing in infested animals. *Bovicola ovis*, *Linognathus pedalis*, *L. ovis*, *Damalinea caprae*, *D. ovis*, *Mecrocanthus stramenius* are the main species of lice in sheep and goat. *Ctenocephalides canis*, *C. felis* and *Echidnophaga gallinariae* are the flea reported to infect sheep and goat (Desalegn *et al.*, 2014)

Control of lice and flea infestation: Avoid overcrowding and regular cleaning of animal sheds helps in reducing the infestation. Shearing is one of the best practice measures to knock down lice populations. Dipping and spraying with effective insecticide can prevent these parasitic infestation. Sulphonamide preparation found to be effective for flea dermatitis.

Nasal bot

Nasal bot is also known as *Oestrus ovis* L. (Diptera: Oestridae). It is a cosmopolitan in distribution and causing nasal myiasis in sheep and goats. The parasitic phase begins after adult females deposit their first-stage larvae (L1) into the nostrils of hosts; these larvae further develop into L2 and L3 in the nasal sinus and horn cavities. Sneezing and nasal discharges are the major clinical signs in infected animals. The pathogenesis caused by *O. ovis* is the trauma resulting from the mechanical action of spines and hooks during larval

movement on mucosal membranes, and, more importantly, an allergic reaction provoked by molecules excreted/secreted by larvae (Angulo *et al.*, 2011).

Control of Nasal bot infestation: Use of systemic insecticides such as avermectin in the fly active season i.e. in late summer can be successful in decreasing both the occurrence and intensity *O. ovis* infections in small ruminants. The oral solutions (Ivomec sheep drench) work well and can be administered subcutaneously at the standard dose of 0.9 mg/10 lbs, except to animals producing milk for human consumption.

Myiasis

Myiasis in small ruminants is the infestation of larvae of certain fly species (Diptera) in living tissues, which feed on the host's living or dead tissues and body fluids. Myiasis is a major costliest diseases of animal welfare issue (Wall and Lovatt, 2015) causing considerable pain and suffering and, if untreated, can result in serious tissue injury, productivity losses, reproduction losses and death. Oestrid flies causing myiasis of sheep and goats are warble flies (*Przhevalskiana silenus*), and the sheep nasal bot flies (*Oestrus ovis*). Wound myiasis is caused mainly by calliphorid and sarcophagid flies. Mostly involved species are- *Lucilia sericata* and *Chrysomya albiceps* respectively.

Control of Myiasis: A decreased stocking rate reduces the risk of fly strike. Shearing before the onset of the fly season will minimize the risk of fly strike. Insecticide growth regulators are the most common approach to blowfly control in prophylactic use (Bisdorff and Wall, 2008). The insecticides recommended for the control of blowfly are Alpha-cypermethrin pour-on and Cypermethrin pour-on and Dicyclanil and the organophosphate OP Diazinon. The synthetic pyrethroid, Deltamethrin, is permitted for treatment only. The insect growth regulators are only used for control and not treatment; they are not suitable for established strike.

Conclusion

Overall small ruminants are found to be infested with diverse ectoparasite fauna suggesting that ectoparasites are among the major constraints in the small ruminant production. Serious attention should be given to further reduce the burden of ectoparasites and maximize the productivity of sheep and goats. Moreover, good veterinary services and management practices should be put in place to control ectoparasite infestations. In addition

further epidemiological investigations that consider different agro-ecology and management system is warranted for appropriate control of ectoparasites.

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