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Biocontrol of Gastro Intestinal Parasite

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Abstract: Gastro-intestinal parasitism constitutes one of the greatest disease problems in grazing livestock worldwide. Infection with nematodes in grazing livestock can cause severe economic losses and endangered animal welfare. Control of these parasites is now becoming a serious concern, particularly in the small ruminant industries, due to the widespread and rapid development of resistance to chemotherapy. Resistance to all anthelmintic now occurs in the major nematode parasites of sheep and goats throughout the world. This is largely the result of a more-or-less complete reliance on anthelmintics for worm control. In addition to development of resistance to chemotherapy, inadequate availability and high cost of commercial anthelmintic are the other important constraints of helminthes control in developing countries. By analogy then, any specific parasite control method may be unsustainable when used in isolation. The more choices and the greater variety of controls used in combination, rather than relying almost solely on anthelmintics, the longer effective worm control can be expected. Biological control offers non-chemical methods of parasite control, which have proven effectiveness. These should form part of integrated nematode parasite control programmes for grazing livestock with the objective of maintaining long-term sustainability.

Key words: Anthelminthic · Biocontrol · Parasite · Small Ruminant

INTRODUCTION

Parasitic infections remain a major constraint to sheep and goat production globally [1]. From parasitic; Helminthes infections remain a major constraint to sheep and goat productivity across all agro-ecological zones and production systems in Africa, particularly in areas where extensive grazing is practiced [2]. In large scale sheep and goat farming systems endoparasites have been become a major threat, which is reflected in the sales figures of many countries [3]. Infections with gastro-intestinal nematodes can have a detrimental effect on animal health [4] that may result in financial loss and overall decreased productivity [5].

Various strategies are in practice to control parasitism which includes pasture management, biological control, dietary management, vaccination and use of anthelmintic drugs [6]. Widely and most common practice being followed these days is the use of chemical anthelmintic [7]. The intensive use has posed a variety of problems including emergence of anthelmintic resistance, e.g. multi resistant *Haemonchus-contortus* had been already isolated. In addition, commercially available anthelmintic are relatively expensive and smallholder farmers are unable to spend major income for purchase of drugs to continue regular treatment [8].

Since the publication of the World Association for the Advancement of Veterinary Parasitology methods for the detection of anthelmintic resistance in the importance of resistance to the three groups of broad spectrum anthelmintic (The benzimidazoles (BZ), imidazothiazoles (levamisole, LEV) and hydro pyrimidines (pyrantel/morantel) and the macrocyclic lactones (avermectins and milbemycins, ML) has increased dramatically in nematodes of sheep and goats in many parts of the world [9]. Work in South Africa [10] and the UK [11] stress that resistance is present to all three broad-spectrum anthelmintic groups and therefore, sheep production is threatened.

In Ethiopia, various anthelmintic have been used in different parts of the country for the treatment of sheep and goats helminthes parasites [12, 13]. Some researcher

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reported existence [14] and some others absence of anthelmintic resistance in region [12, 15]. Albendazole was suspected for development of resistance, while Ivermect in and Tetramisole were found to be effective [16]. Three anthelmintic (Albendazole, Tetramisole and Ivermectin) were effective against the gastrointestinal nematodes of sheep kept under extensive management by small holder farmers [17].

The threats of anthelmintic resistance, risk of residue, availability and high cost, especially to farmers of low income in developing countries, have led to the notion that sustainable helminthes control cannot be achieved with commercial anthelmintic alone. Despite notable ongoing activities to identify and evolve new anthelmintic classes by a shrinking list of institutions, there is doubt that we will see the release of a product with a new mode of action in the livestock area in the near future [18].

Other alternative options like biological control, vaccine and traditional medicinal plants are being examined in different corners of the world [19]. Among the alternative methods, there is considerable and expanding interest in traditional herbal dewormers in both industrialized and developing countries [1]. Evaluation of the activities of medicinal plants claimed for anthelmintic property is getting attention these days [20].

However anthelmintic resistance can cause major problem in our country like economic losses and stress on animal. So that to improve this anthelmintic resistance alternative anthelmintic control strategies is essential. Therefore, the objectives of these review are;

- To provide current scientific knowledge of biological control of parasite

Biological Control of Parasite: Biological control (BC) may be defined as the use of one living organism to achieve control over the targeted organism like parasite and thus reducing the population of pathogen below a threshold level where it cannot cause clinical problems and/or economic losses in the animals [6]. The philosophy behind BC is that by using one of the natural enemies of nematodes, it will be possible to reduce the infection level on pasture to a level at which the grazing animals avoid both clinical and subclinical effects due to parasitic [21]. Of all possible antagonistic organisms' only nematophagous fungi, earthworms and dung beetles have realistic potential as biological control agents, although there are several species that little or nothing is known about and therefore their potential use for biological control cannot be assessed [22]. For example, biological control of parasitic nematodes in sheep seems to hold promise for the future, but to be able to assist producers, the optimal delivery system needs to be refined and further developed [23].

Earth Worms: Earthworms are soil inhabitants that live on organic matter deposited on the soil surface. Organic matter gets pulled down below the surface either for food or to plug the earthworms burrows. Therefore, the major contribution of earthworms towards the biological control of nematodes is seen in the destruction of eggs and larvae by digesting them and transferring them to deeper levels of the soil where chances that they can reach the surface as infective larvae are very low [22]. A New Zealand study examined the ability of mixed earthworm populations, alone or in combination with other bological control organisms to reduce pasture infectivity in two experiments (spring and autumn) [24].

Dung Beetles: The term 'dung beetle' refers to those beetles that live partly or exclusively on the dung of herbivorous; most species belong to the family *Scarabaeidae*. Adult beetles use the liquid contents of manure for their nourishment and some species form dung balls which they bury and lay their eggs in, others just live in the manure pats [25].

The activity of dung beetles is being discussed controversially: by breaking up the pats and partially burying the manure, they enhance the drying up of the dung which deteriorates growing conditions for larvae, but by the same activities in bad weather conditions they might help the larvae to survive by airing out the pats and thereby providing oxygen to the larvae [22].

The influence of dung burial in respect to larval development with the result of significantly more larval recoveries than when dung was not buried, although dung was manually buried in order to mimic the natural activities of the dung beetle [24]. Also mention that results of studies with dung beetles have been variable, some species reduce and others increase larval numbers [26].

Nematophagous Fungi: It is one of biological control in which use of the naturally occurring nematophagous or nematode destroying fungi to control parasitic nematodes in ruminants. Nematophagous fungi are soil inhabitants and can be found in most soil types throughout the world. Research has shown they are found more frequently in organic production systems than any other [27].

The fungi of the nematode trapping group all have in common that they form a vegetative hyphal system that produces trapping organs such as sticky nets, knobs or rings. When for example a nematode get strapped, the fungi penetrate the nematode cuticle with their hyphae that then grow out and fill the body of the nematode to finally digest it. The idea of using nematophagous fungi to control parasitic nematodes is based on the reduction of the larval level in the faces before larvae reach the vegetation, which requires a high density of spores in the faces [28].

There are two possible ways to reach that high spore density, the first is to artificially inoculate the faeces and the second way is to administer the there was evidence found for predaceous fungi working against parasitic nematodes. Research with nematode-trapping fungi has documented the potential as a biological control agent against the free-living stages under experimental and natural conditions [1].

Among predaceous fungi, Nematophagous microfungi, such as *Duddingtonia flagrans*, could be given in an oral formulation. After passage through the bovine gastrointestinal tract, they reduce pasture contamination by preying on the pasture larvae [29]. This technology has been applied successfully under field conditions in all livestock species and is an environmentally safe biological approach for control of worms under sustainable, forage-based feeding systems [30]. Furthermore, *Duddingtonia flagrans* shown promising results of reducing the number of infective larvae that migrate onto the pasture and it also showed that there was no effect on larval migration of prior and post deposited faeces [31].

CONCLUSION AND RECOMMENDATIONS

Gastrointestinal nematodes remain a major threat to the health and welfare of small ruminants all over the world having severe consequences on the animal as well as the livestock leading to economic loss and restricted productivity. Anthelmintic has been used as the major option to control this pathogenic nematode which has resulted in parasitic drug resistance and affect environment. To improve this problem knowing about the biological control strategies of nematode in small ruminant is very necessary. Depending upon the above conclusion the following recommendation is forwarded;

- Awareness creation should be given to small ruminant owners about alternative control methods of GIT parasites.
- Bio integrated nematode parasite control programmes for grazing livestock should be implemented.
- Further investigation should be focused on biological control nematode parasite in livestock.

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