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BIOLOGICAL ANTAGONISTS FOR CONTROL OF PARASITIC DISEASES

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Abstract: The present literature reviews biological methods for control of parasitic diseases in animals with a hope to encourage eminent scientists and practicing veterinarians in the field of veterinary practice to apply these methods as a component of integrated insect management.

Keywords: biological methods, biodegradable, Plant extracts, Fungi species, potential antagonists.

Introduction

Parasitic diseases are a major constraint to efficient livestock production throughout many parts of the world (Morrison and Tomley, 2016). Chemical control methods have been used since years conventionally for controlling parasitic diseases. Largely because of the remarkable developments in these products in terms of efficacy, safety, spectrum of activity while remaining relatively inexpensive, livestock producers have relied almost exclusively on their use (Waller and Faedo *et al*., 1993). Extensive usage of drugs has resulted in resistance in parasites' populations (Minho *et al*., 2008). Moreover, the rapidly increasing number of organic farms in many countries over the last ten years and the consumer pressure for reduced chemical residues in products require finding of new, safe for the animals and environment, methods for control of parasitic diseases (Sanyal, 2009). Thus, biological control measures of animal parasites have been gaining importance in controlling parasitic population. The present literature reviews biological control methods of parasitic diseases which would be resonably cheap and biodegradable.

1. Plant extracts:

(i) Condensed tannins

Paolini *et al*. (2003) have assessed the possible impact of condensed tannins on goats infected with adult *Haemonchus contortus* and reported that major consequence of tannin consumption in goats reduced worm fecundity and egg output.

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Paolini *et al*. (2003) investigated the effects of condensed tannins (CT) on adult populations of *Trichostrongylus colubriformis* and *Teladorsagia circumcincta* and reported that tannin administration was associated with a decrease in egg excretion and a decrease in female fecundity.

Minho *et al*. (2008) have investigated the anthelmintic effect of condensed tannin extracts (CTE) from *Acacia molissima* on lambs naturally infected with *H. contortu*s and *T. colubriformis* and confirmed the anthelmintic effects of CTE on gastrointestinal nematodes in lambs and demonstrated the potential use of CTE as an alternative endoparasite control in livestock.

(ii) Other plant products

Administration of plant-based preparation Loshtak *per os* as tablets made from standardized dust of bryony (*Bryonia alba*) roots was studied in experimental dictyocaulosis of lambs (*Movsesyan et al., 1994)*, in experimental ascaridosis of chickens (Chubarian *et al.,* 2002). It has been shown that the preparation increases the animals' natural resistance to these infections through activation of immunocompetent cells and phagocytes (Movsesyan *et al., 2004)*.

Hounzangbe–Adote *et al*., (2005) studied the *in vitro* effects of extracts of four tropical plants (*Zanthoxylum zanthoxyloides, Newbouldia laevis, Morinda lucida* and *Carica papaya*) on the egg, infective larvae and adult worms of *Trichostrongylus colubriformis* and stated the presence of some anthelmintic properties associated with the four plants, which are traditionally used by small farmers in western Africa.

Hordegen *et al*., (2006) investigated the effect of extracts of six different plant species [Bromelain, the enzyme complex of the stem of *Ananas comosus* (Bromeliaceae), the ethanolic extracts of seeds of *Azadirachta indica* (Meliaceae), *Caesalpinia crista* (Caesalpiniaceae) and *Vernonia anthelmintica* (Asteraceae), and the ethanolic extracts of the whole plant of *Fumaria parviflora* (Papaveraceae) and of the fruit of *Embelia ribes* (Myrsinaceae)] against exsheathed infective larvae of *H. contortus* using a modified methyl-thiazolyl-tetrazolium (MTT) reduction assay and reported that these extracts had an anthelmintic efficacy of up to 93 %, relative to pyrantel tartrate.

2. Fungi species

Larsen *et al*. (1995) have investigated the effect of the *Duddingtonia flagrans* on calves infected by trichostrongyles under natural grazing conditions and reported that daily feeding with the microfungus *D. flagrans* during the first 2 months of the season reduced herbage infectivity and lowered acquisition of Ostertagia sp. and Cooperia sp. faecal larval cultures revealed that the reduction in the infectivity was due to nematode-destroying effects of the fungi in the dung excreted by the fungus-treated calves (Salkova *et al*., 2014).

Chandrawathani *et al*. (2003) conducted trials aimed at control of nematode *H. contortus* in small ruminants in a wet, tropical environment using *D. flagrans* and reported that at lower dosage (125 000 spores/kg live weight per day), larval population reduced to 80 and 90 % while at the higher dose rate (250 000 spores/kg live weight per day), there has been virtually complete suppression (>99 % reduction) of larval recovery.

Beauveria bassiana and Metaregium anisopeliae have been found to cause mortality in some ticks and insects (Yadav *et al*., 2017).M. Anisopheles have been successfully tried against the Boophilus microplus and is giving encouraging results (Ment *et al*., 2010).

3. Bacteria

Strains of the entomopathogenic bacterium Bacillus thuringiensis are among the most widely used antagonists in biological control of insects where target insects are killed by a gut toxin which is released from crystal proteins in the bacterial spores (Pirali-Kheirabadi, 2012). In some countries, B. thuringiensis var. israelensis is available for control of mosquito larvae (Ravensberg 1994). The black fly Simulium damnosum which is an important vector of Onchocerca volvulus, causative agent of river blindness, is susceptible to B. thuringiensis var. Israelensis (Pirali-Kheirabadi, 2012).

4. Amphibians and fishes

The water-tortoise Pelomedusa subrufa was reported to able to remove ticks from black rhinos in a streambed (Mwangi *et al*., 1991). The mosquito larvae may be controlled biologically by predatory fish such as Gambusia affinis and the Guppy poecilia (Pirali-Kheirabadi, 2012).

5. Rodents and mammals

Sorex araneus prey on ticks and at times preferred them to alternative foods. (Mwangi *et al*., 1991). Shrews seem to locate hidden ticks by their smell while mice and rats are often cited as preying on ticks (Pirali-Kheirabadi, 2012).

6.Ants: (Hymenoptera) and beetles

The predation in open areas was two to eight times higher than in woody ones. (Mwangi *et al*., 1991). Fire ants predate on the ambylomma tick (Yadav *et al*., 2017). Application of S. invicta in the United States markedly reduced the number of anaplasmosis in seropositive cattle in Louisiana (Jemal and Hugh-Jones., 1993). Wild rabbits living in

Formica polyctena infested plots had far fewer ticks than those in ant-free plots and rabbits sprayed with formic acid were free of ticks for at least 5 days (Buttner., 1987).

Conclusion

Biological control of parasites though not succeeded well in Veterinary practice, it provides promising results as a substitute to chemical control and still further research is needed for the development of potential antagonists which can be affordable by a farmer.

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