THE SCIENCE WORLD
A Monthly e Magazine
ISSN:2583-2212
May, 2023; 3(05), 785-789

Popular Article

Parasitic infections and control approaches in Rajasthan: Present and future perspectives

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https://doi.org/10.5281/zenodo.7956586

Introduction

Parasites and parasitism are major constraints to economic gains from animals especially in developing countries like India, in terms of reduced production, control, treatment and mortality costs. Rajasthan, contributing 7.22% and 12.47% in national bovine population, consists of 13.9 million cattle and 13.7 million buffaloes with 6th and 2nd position in cattle and buffalo populations, respectively in India (DAHD, 2019). Based on its diversified ambiences *viz*. climatic parameters, cropping pattern and irrigation availability and arid conditions, state has been divided into ten agro-climatic zones (ACZ). Major parasitic infections *viz.Haemonchus* sp. *Oesophagostomum* sp., *Cooperia* sp., *Trichostrongylus* sp., *Strongyloides* sp. and *Ostertagia* sp. have been reported in the dairy animals from different parts of the state in variable prevalence rates and associated risk factors (Choudhary et al 2018 a,b; Panwar et al 2018, 2019). As far as the control and management of these infections, it is primarily dependent on the anthelmintic approach presented in Table 1

However, extensive use invites them alongside like resistance, residues, ecotoxicity, cost involved which intensifies the problem and demand alternative approaches. Blend of approaches including non-chemical alternatives to parasite control, modulation of immunity to parasites by genetic and nutritional interventions as well as region-specific deworming schedule and control strategies are needed to be designed and implemented for cost-effective and environment friendly control of gastrointestinal parasites.

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Published 20.05.2023

Table 1: Common infections present in dairy animals of Rajasthan, anthelmintic drug and their mode of action:

Parasites	Pathogenesis	Drugs	MOA
Fasciola.sp.	Liver cirrhosis, pipe stem liver, black disease, death in acute case	Benzimidazolesgroup (mebendazole, albendazole, thiabendazole, fenbendazole, triclabendazole, flubendazole)	Disrupting energy metabolism. Reduction of enzyme activity (acetylcholinesterase, carbohydrate catabolism)
Amphistomes	Immature flukes cause watery and foetid diarrhoea	**Salicylamides/ substituted phenols groups (oxyclozanide, niclosamide,** closentel, hexachlorophene)	Uncouple oxidative phosphorylation and decrease high energy phosphate compounds and nicotine amide, adenine, dinucleotide. Inhibit succinate dehydrogenase activity and fumarate reductase system
Strongyles	knotty gut, anaemia may cause death	Organophosphates (trichlorphaon, haloxon, dichlorvos)	Inhibit acetyl-cholinesterase enzymes
Strongyloides sp.	Catarrhal enteritis. Death in young animals and foot rot	Ivermectin/ milbemycin(doramectin, selamectin, ivermectin, moxidectin)	Bind to GABA- gated Cl- channels in nematodes &insects,block the transmittance of electrical activity in nerves &muscle cells.
Moneizia sp.	High infection cause obstruction and diarrhoea	Salicylanilides/ substituted phenols-niclosamide	Inhibiting oxidative phosphorylation in mitochondria and interfering with anaerobic generation of ATP
Eimeria sp.	Bloody and severe blood less pasty mucoid diarrhoea, convulsions, tremors	Pyrimidine derivatives (Amprolim)	Blocks thiamine uptake and prevent carbohydrate synthesis.
Ascaris sp.	abdominal pain, vomiting	*Piperazines- Piperazine*	Selectively to muscle membrane GABA receptors agonist

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Future prospects:

As per the literature cited in this regard, targeting the most effective method for effective parasitic management, the integrated parasite management approach including management, biological, ethno-veterinary, nutritional intervention and immuno-modulation. As regards to safe pasture management**,** by pasture resting and rotation techniques, restricted grazing patterns like hallow grazing or avoiding grazing surrounding the fecal pat using mixed species grazing may be applied. These strategies are not readily adopted by cattle farmers due to lack of quality pastures and limited resources and this may be related to the relative ease and low cost of using anthelmintics compared to labor-intensive fencing and moving. Growing awareness for strategic nutritional supplementation with far reaching consequences *viz.* increased production in terms of meat, milk, wool, growth and reproductive efficiency, parasite control, enhancement of immunity and disease resistance are well reported around the globe including India. Understanding the role of nutrition in improving both resistance and resilience of the host to GI parasites may be used to keep host acquired immunity activated and reduce dependence on pesticides for prophylaxis. Supplementation of fish meal, vitamin A, D and B complexes along with minerals like zinc, iron, cobalt, sodium, potassium, phosphorus, are essential for developing the immunity and proper functioning of immunological response against the parasites (Huges and Kelly, 2006). Inclusion of ethno veterinary products comprising of novel forage crops (Lotus or chicory), botanical dewormers like garlic (pills, powders, fresh, tinctures) have showed effective responses. Several other plants include papaya, pineapple and figs containing cysteine proteinases may be used to damage the cuticle of nematodes (Waller *et al.*, 2004). *Acacia arabica* has been used against paramphistomosis (*Cotylophoroncotylophorum*) (Veerakumari*et al.*, 2012).Seed extracts of *B. frondosa* have potent embryonicidal activites. Leaves of nirgundi (*Vitex negundo*), khorpad (Aloe vera), Neem seeds, kirayat (*Andrographis paniculata*), akamadar (Calotrophis), are to be ground well by sprinkling little water and filtered.Garlic, Tulsi, neem leaves, turmeric, seethapal seeds each 10-20 gm are ground together and boiled in 250 ml of neem oil,whole plant of Raimuniya (*Lantana camara*) is chopped and crushed and diluted with the urine of cattle 3 days and external application,Boil tobacco stalk 250 gm in 2 lit. of water and add 5 litters of water and sprayed over the body of 10-20 animals have been used effectively to control tick infestations in dairy animals. Biological control still demands the required attention as the parasite niche can easily be disturbed by the introduction of natural enemies *viz*. ducks for snails, poultry for

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***Published* 20.05.2023**

ticks, natural enemy snail species. However, novel approaches like hematophagous predacious fungi are still under exploration and may be used in near future.

Conclusion:

Regarding parasite control in the state, chemical approach is considered as the most reliable and the most applied approach. Being the largest geographical state and having a huge variation in the geographical variation in terms of hyper arid to flood prone conditions, designing of area specific deworming schedules as well as control strategies are of utmost importance and single approach parasite management needs reconsideration. Integrated parasite management in terms of chemical, non-chemical, nutrition, supplementation as well as biological control need to be implemented.

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