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Neem as Herbal Alternative for Controlling Parasitism in Livestock

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Abstract

Parasitic infections are commonly encountered in livestock reared under traditional animal husbandry system in India. The parasitic infections especially the helminths infection result in great economic losses to live stock industry due to deterioration in health and reduced production of animal. They are treated conventionally with commercially available chemical anthelmentics which have long been considered as the only effective way of controlling parasitic infection. Regular use of chemical anthelmintics develops resistance of helminths to various anthelmintics compounds which is a threat to their use in near future and thus arises a need of development of alternative approach. Herbal based anthelmintics could be the best possible alternative of these synthetic anthelmintics, Neem have proven medicinal properties, being anthelmintic, antifungal, antidiabetic, antibacterial, antiviral, anti-infertility. This article attempts to present some studies conducted for testing efficacy of Neem as anthelmintic in different livestock species.

Keywords: Chemical Anthelmintic; Anthelmintic Resistance; Ethno Veterinary; Neem.

INTRODUCTION

Parasitic infections are commonly encountered in bovines reared under traditional animal husbandry system in India. The parasitic infections especially the helminths infection result in great economic losses to livestock industry due to deterioration in health and reduced production of animal. Studies from different parts of the country reported that among G.I. parasites of livestock, strongylus are recognized as the most important helminth parasites of cattle. To deal with this problem of gastrointestinal parasitism, when it comes to treatment, either they are commonly over looked as majority of the infected animals show little obvious clinical signs and their effects are gradual and chronic (Raza *et al.*, 2010), thus not drawing the immediate attention of the farmer, or treated conventionally with commercially available chemical anthelmentics. Chemical anthelmintics have long been considered as the only effective way of controlling parasitic infection. However, as these are very expensive and sometimes unavailable

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to farmers in rural areas, and also have some associated adverse effects, livestock producers are not interested to use these anthelmintics. Also, regular use of chemical anthelmintics develops resistance of helminths to various anthelmintics compounds. Anthelmintic resistance is a threat to agricultural incomes, and has been reported from all the four corners of the world, to all available drugs, in all classes of helminthes (Lalchhandama, 2010). Emergence of anthelmintic resistance along with associated adverse effects and the high cost of synthetic anthelmintics need development of alternative approach. Herbal based anthelmintics could be the best possible alternative of these synthetic anthelmintics, as plants has long been used for ages by farmers and traditional healers to treat parasitism and improve performance of livestock. The use of medicinal plants is the fundamental basis of folk medicine that covers the experience of many generations and is the basis for the creation of many medicines. The World Health Organization has estimated that 80% of the populations of developing countries rely on traditional medicine, mostly plant drugs, for their primary health care needs (WHO, 2008). Regardless of their wide ethnoveterinary usage scientific evidence on the anti-parasitic efficacy of most plant products is limited. Many studies have been conducted to demonstrate the anthelmintic efficacy of different herbs, this paper compiles such studies conducetd in particular consideration with Neem.

Commercially Available Synthetic Anthelmintics:

Anthelmintics provides an excellent tool for controlling parasites. The treatment of intestinal nematode infections largely depends on the use of modern synthetic anthelmintics till date and anthelmintic market is the largest sector of veterinary pharmaceutical industry. The history of modern anthelmintics dates back in the middle of the 20th century with the introduction of phenothiazine and piperazine, which were discovered in 1940 and 1954, respectively. They are considered to be the first generation of the broad spectrum drugs. The second generation of broad spectrum anthelmintics (included benzimidazoles, probenzimidazoles, imidazothiazoles and the tetra-hydro-pyrimidines) were released in 1960's. Third generation of broad spectrum anthelmintics, the macrocyclic lactones were emerged in the early 1980's. Dorny *et. al.*, (1995) reported that Albendazole, out of Benzimidazoles was found to be highly effective for control of Strongy leinfection in cattle and sheep. Verma and Panda (1998) found that when sheep and goats naturally infected with gastrointestinal nematodes were treated with Albendazole at the dose rate of 5mg/kg body weight, there was 100 percent reduction on EPG count by seventh day post treatment. Pal *et al.*, (2001) found that treatment with Fenbendazole @10 mg/kg b.wt resulted into reduction of EPG count of faeces from 1812.80 ± 298.04 on day zero to 0 level from seventh day onwards. Khillare *et al.*, (2002) reported that treatment with Fenbendazole @ 5mg/kg b.wt was found 97.44% effective against Strongyle infection in sheep. The cattle industry still relies heavily on the use of anthelmintics to alleviate the infections of gastrointestinal nematodes and liver fluke (Borgsteede *et al.*, 2008). Pandit *et al.*, (2009) evaluated the efficacy of three commonly used anthelmintics (Albendazole, Levamasole and Ivermectin) against naturally occurring gastrointestinal nematodosis in Garole sheep under field condition. They found that ivermectin and levamisole were 98.56% and 99.52% effective respectively while Albendazole was 99.04% effective.

Chemical anthelmintics have also been reported to have toxic and other side effects to the animal and the administrator (Nalule *et al.*, 2011). There are some adverse effects associated with these synthetic compounds which have been reported from time to time in different species of animals viz; Oxfendazole shows testicular toxicity in laboratory animals (Okamura *et al.*, 2004). Thiabendazole is nephrotoxic (Tada *et al.*, 2001), it can cause haemosiderosis and liver damage (Tada *et al.*, 1996). Benzimidazoles reported to pose a risk of developmental damage in foetus of laboratory animals (El-Makawy *et al.*, 2006) thus, administration of benzimidazole derivates to pregnant animals should be considered carefully. Benzimidazoles pose a risk if released into water as they show developmental toxicity to fish and aquatic invertebrates (Carlsson *et al.*, 2011). Ivermectin is responsible for the development of neurological adverse effects (Hsu, 2008) because of higher permeability of blood brain barrier for allows it to enter central nervous system.

Besides the evident economic benefits of chemical anthelmintics, it is important to consider that most of the commercially available chemical anthelmintics bears indication for avoiding milk for seven days. In such situation herbal anthelmintics could be seen as need of the hour.

Anthelmintic Resistance and Ethnoveterinary

Anthelmintic resistance (AR) is said to have developed when an anthelmintic drug fails to kill the exposed population of parasites using the dose

that is recommended the rapeutically. Emergence of AR is a raising problem in livestock farming that threatens the success of anthelmintic therapy and reduces livestock productivity.

The first report of AR development was published in 1957 when phenothiazine showed varying degrees of efficacy against different strains of nematodes in sheep (Drudge *et al.*, 1957). Since then, the incidence of resistance development against different anthelmintic agents continued to rise at a pace and reports showing failure of different anthelmintic compounds have been emerging from different parts of the world. Following the introduction of a new anthelmintic compound, emergence of resistance against that particular drug appeared fairly soon after their marketing. It has been seen that the resistance develops after only after a few years of marketing of the anthelmintic compound for example, after three years in Thiabendazole (Conway, 1964), after eight years in Levamisole (Sangster *et al.*, 1979) and in case of Ivermectin it was also reported after eight years of introduction to market (Van and Malan, 1988). A survey carried out by FAO and the Office Internationale des Epizooties (OIE) in 77 out of 151 OIE member countries, revealed that over 50 percent of countries are affected by parasite resistance.

This suggests that any developed new drugs will inevitably also be affected by the problem of AR in due course. Therefore, it is of ultimate importance to find better ways to use the anthelmintic substances we do have or will have in a most sustainable manner, preserving their efficacy as long and in as many parasite species as possible. The incidence of AR has compelled to adopt alternative control strategies. Plants and their products are the most sought alternative to various chemical drugs and so for the anthelmintics as well.

Plants have been used from ancient times to cure diseases of man and animals. This system of therapy is commonly referred as folk, or indigenous' medicine. The plant kingdom is known to provide a rich source of botanical anthelmintics, anti-bacterials and insecticides. Herbal products are being increasingly used as performance promoters for livestock, which may be included as complimentary or substitute antibiotics (Carlo *et al.*, 2003). The Chinese herbal medicine had significantly positive effects on the production performance of cows (Sun-QiYing, 2004). The locals have used folk herbal remedies to maintain their livestock population healthy (Nag *et al.*, 2007). The folk knowledge of ethno veterinary significance has been identified by tribals through a process of experience over hundreds of years (Nag *et al.*, 2007).

A number of medicinal plants have been used to treat parasitic infections in man and animals. More than 50,000 flowering plants are used for medicinal purposes across the world (Schippmann *et al.*, 2002). There are many plants which have been reported in the literature for their anthelmintic importance. With the utilization of our indigenous medicinal plants and plant materials, it may be possible to minimize the dependence on commercial medicines which only a few of our farmer can afford. Medicinal plants are often cheaper and available than the commercially-produced drugs. This may offers a way out by making use of resources available within the communities themselves.

Despite the steady increase in demand for herbal medicines over the past decade worldwide, a great majority of herbal products are not pharmacologically assessed for their quality, safety and efficacy, nor are they licensed as medicine (Innocent and Deogracious, 2006).

Neem:

Neem *(Azadirachta Indica)* is a perennial tree in the mahogany family Meliaceae and is native to India, growing in tropical and semitropical regions. The Neem is a tree noted for its drought resistance. Normally, it thrives in areas with semi-arid to sub-humid conditions. It is a typical tropical/subtropical tree and exists at annual mean temperatures between 21-32^{o}C. It can tolerate high temperatures.

In India, the tree is variously known as "Divine Tree", "Heal All", "Nature's Drugstore", "Village Pharmacy" and "Panacea for all diseases". Products made from Neem have proven medicinal properties, being anthelmintic, antifungal, antidiabetic, antibacterial, antiviral, anti-infertility, and sedative. It is considered a major component in ayurvedic medicine and is particularly prescribed for skin disease. It is a common tree in India and can be seen through out the country. Leaves of the Neem tree are reported to be fed to ruminants in India and other parts of Asia during the dry season (Shukla and Desai 1988).

The major active constituent in Neem is azadirachtin. It also includes nimbinin, nimbidin, glucoside, nimbosterin. nimbosterol, nimbectin and fatty acid (Baquar and Tasnif, 1975).

Efficacy of Neem as Anthelmentic:

The fresh Neem leaves provided to sheep at the rate of 3g/kg body weight, significantly reduced

the mean fecal egg count compared to the control group from twelfth day onwards of dosing. At the end of the study, on slaughtering of animals number of parasites were found significantly higher in the control group compared to the treated group (Chandrawathani *et al.* 2006). Radha krishnan *et al.*(2007), evaluated in vivo anthelmintic effect of Neem leaves by providing Neem leaves in complete diet to infected group and found that the EPG count between Neem challenged and control challenged groups were not statistically different at 21st, 28th and 35th day post infection where as it was highly significant ($p<0.01$) from 42nd day onwards. Neem leaves provided to early lactating cows at the rate of 200 mg/kg live weight of animal beside the traditional straw based diet over a period of four weeks resulted into decrease of Egg per Gram of Faeces (EPG), after treatment, 300.000±45.743 compared to before treatment which was 381.250±65.234 (Moniruzzaman, 2009). Iqbal *et al.*, (2010) observed that crude powder and crude methanolic extracts of Neem were found effective at 3g/kg b. wt. with a maximum reduction of 29.3% in eggs per gram of feces. In the in vivo study conducted by Chandrawathani *et al.*, (2013) where they provided goats with Neem leaf capsule containing 3 grams of Neem leaf powder per capsule at the rate of 1 capsule per 5 kg of animal weekly before grazing and feeding for 3 weeks consecutively found significantly lower egg count compared to the control animals after the 5th week of treatment. Neem leaf powder have anthelmintic property although slower acting compared to chemical anthelmintics (Jamara *et al.*, 2015), a single dose of Neem leaf powder provided to cattle @500 mg/kg body weight resulted in 78% reduction in EPG on day seven and 98% reduction on day 14th and 100% reduction by the day 28, compared to Fendendazole @5 mg/kg body weight where to 85% reduction in EPG was observed on day 7 and 100% reduction on day 14th. Dongre *et al.*, (2015) observed significant reduction in fecal egg counts of goats treated with 1.0 g/kg. b.wt. Neem leaf powder as 21.9% on day 7 day and 34% on day 15 post-treatment. Sarker *et al.*, (2016) supplemented powder of Neem @ 200 mg/kg live weight of the animal and compared its efficacy against the Albendazole (7.5 mg/kg live weight). They observed that, Neem leaf, and Albendazole had significant ($p<0.01$) effect in reducing EPG with the progress of the experimental period. The commercial albendazole ended 100% reduction in the faecal egg whereas the Neem leaf treated group shown 95.81% reduction in EPG on day twenty eighth. Mamta *et al.,* 2022 reported that the treatment with synthetic dewormer (Macfen-plusTM, a combination of Ivermectin and Fenbendazole) did not differ significantly with the treatment of herbal deworming with neem and garlic combination, in reducing fecal egg count. reduction (FECR) in cattle.

CONCLUSION

To avoid the consequences of anthelmintic resistance, the synthetic or commercially available anthelmintic needs herbal alternatives. Neem has long been known for its various medicinal properties in folklore. The studies conducted using different parts of Neem as anthelmintic mentioned here and a comparative account of their efficacy with synthetic anthelmintic indicated that Neem has a tremendous potential to be a substitute, but additional research is required to standardize the dose.

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