AHC -17

Prospective Use of Anthelminthic Plants for Sustainable Worm Control in Nigeria

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Abstract
From the beginning of human civilization, medicinal plants have been identified and used traditionally for the therapy of various conditions. Some of these medicinal plants contain active principles which have been reported to be highly potent against parasites. Internal parasitism is a major disease syndrome in pastoral animals because environments that favour pastoralism are the same as those which favour the development and survival of the free-living stages of helminth parasites. Helminth infections cause tremendous health hazards in livestock production ventures, resulting in increased morbidity, mortality and decreased productivity of affected flocks with huge economic implications. Control of these parasites has become a major challenge due to the development of resistance by these parasites to available synthetic drugs. The search for more viable alternatives for helminth control has exposed the potentials of plants and phytochemical substances as anthelmintics. It is therefore recommended that more research trials be carried out in this area. Also, already discovered herbal anthelmintics should be standardized and regularized for use by developing and implementing a good biotechnology policy framework by the Government, especially in developing countries like Nigeria.

Keywords: Anthelmintics, medicinal plants, helminth parasites, animal health

Introduction

Ruminant livestock plays an important role in the socio-cultural life of farming communities as a partial determinant of wealth and also having value as important readily convertible assets and in food production systems of developing countries (Blackburn *et al.,* 1984; Chiejina, 1986). Several studies have been conducted on the prevalence of gastrointestinal nematodes affecting different animal species all over the world. In the tropics, strongyles have been shown to be the most common, economically important gastrointestinal nematodes affecting grazing animals worldwide (Sykes, 1994). High prevalence rates of various gastrointestinal nematodes have been reported by several workers. In Kenya for instance, the widely reported Strongyle genera of importance include *Haemonchus, Trichostrongylus, Cooperia* and *Oesophagostomum.* (Ng'ang'a *et al.,* 2004). This is also similar to the report by Adejinmi *et al.* (2015) in South West Nigeria where a total prevalence rate of 75.75% was observed in Red Sokoto goats. It was suggested in the study that the observed high prevalence rate may have occurred due to the management system of the animals. Prevalence rates of 76.5% and 35% have also been reported in South West Nigeria and North Eastern Nigeria respectively (Sylvia *et al.,* 2015). *Haemonchus contortus, Trichostrongylus axei, Nematodirus axei, Teladorsagia circumcincta* and *Cooperia* are the most implicated parasite species causing disease and economic losses in grazing animals. However, *Haemonchus contortus* is considered the most pathogenic of the species affecting ruminants (Perry *et al.,* 2002).

Pathogenesis of helminthosis

The pathogenic effects of helminth parasites may be sub-clinical or clinical. Young animals are most susceptible. The effect of these parasites is dependent on the number of parasites and the nutritional status of the host animals. Also, clinical signs such as weight loss, anemia, reduced feed intake, diarrhea, reduced carcass quality, reduced wool production and wool quality and mortality could be seen in affected animals (Ngongeh *et al.,* 2007). Severe blood and protein loss into the abomasums and intestine due to damage caused by adult parasites often results in oedema in the submandibular areas and anaemia (Morley and Donald, 1980).

Several nematodes may also cause host reactions such as inflammation, hypertrophy, hyperplasia and nodule formation in their host's tissues. Repeated contact between the host and the parasite sensitizes the host to the antigens of the parasite and may produce varied physiologic and pathological effects.

Prevention and control of helminthosis

The general aims of nematode control are to limit host challenge to a level which does not compromise performance or welfare of the animal, while at the same time enabling the development of immunity. Control may be based on grazing management, prophylactic anthelminthic treatment and integrated parasite management systems taking into account these two management schemes.

Control by grazing management

This method aims at reducing the contact of susceptible animals with infective stages of helminth parasites. This control method is considered to be more sustainable than the use of anthelmintics and may be the most practical method for use by farmers who cannot afford to purchase expensive drugs. It incorporates the knowledge of the epidemiology of the helminth parasite and other management practices like good hygiene and adequate nutrition. Some strategies employed in this method include; reduction of stocking densities, adequate nutrition and hygiene, the timing of reproductive events such as lactation or pregnancy, alternative grazing with animals of a different species, pasture resting, and rotational grazing (van Wyk, 1990; Cabaret *et al.,* 2001).

Control by chemoprophylaxis and chemotherapy

This method aims at eliminating the parasitic stages of the parasite in the host, thus preventing the passage of eggs and larvae into the environment. Chemoprophylaxis is usually aimed at pre-empting the occurrence of clinical disease caused by parasites in the host. This is different from Chemotherapy which is carried out after the animal has succumbed to clinical disease. Chemoprophylaxis is the most commonly and extensively used method for the control of helminthosis throughout the world (Kaplan, 2004). It is usually recommended that the frequency of treatment should be determined by the epidemiology of the dominant parasite, the stocking rate in the particular area and the benefits accrued from the control regime adopted (Sangster, 1999).

This is particularly necessary as a result of the emergence of resistant strains of worms. In humid climates in Nigeria for instance, the environmental conditions are permanently favourable for the development, survival and transmission of infective larvae. In these climates, it is important to ascertain levels of parasitism and the epidemiology of the species present in order to satisfactorily determine the frequency and timing of strategic anthelminthic dosing. Frequent and indiscriminate use of anthelmintics interferes with the development of immunity against helminthes by animals and this could lead to selection of resistant genes. Anthelminthic resistance (AR) has become a serious problem in many countries and resistance of parasites to one or more anthelmintics is now widespread, particularly in sheep. The loss of inexpensive drugs against helminths as a result of the development of AR has made it expedient to explore and develop new ways of worm management in order to reduce selection for resistance (Waller, 1997).

Considering these challenges to the continued use of synthetic drugs as therapeutic agents to combat the problem of helminth infections, there is a great need for newer, more reliable, efficacious, commonly available and environmentally friendlier anthelminthic agents. Herbal medicines present a suitable alternative in this case.

Potentials of plants as anthelmintics

Plants are natural products which have shown an advantage of production of less harmful effects and with less or almost no deposition of residues in the treated individual. They have also been shown to regulate life processes and prevent diseases (Eguale *et al.,* 2011). Several Nigerian plants have been shown traditionally to have medicinal value in the control of helminthosis and other ailments in man and animals. Many antibiotics, anthelmintics, anti-oncogenic, antiprotozoan and a host of other drugs have been produced from plants (Onyeyili *et al.,* 2001). Plants also provide cheaper alternatives to synthetic drugs. It has also been suggested that the diversity of herbal anthelmintics has precluded the occurrence of resistance despite several years of use (Nwude and Ibrahim, 1980). Herbal remedies could also generate useful information needed in the development of drug alternatives for livestock which are suited to the local environment. It also presents a key veterinary resource and has the potential to add new drugs to the Pharmacopoeia (Cotton, 1996). Several plants have been shown to have anthelminthic properties and they include leaves of *Acalypha fimbriata, Clerodendrum paniclatum, Delonix regia, Greenwagodendron spp, Lageneria sicerata* and *Neruyum oleander*. Dried seeds of *Abrus prectorius*, *Acacia cookii* dried bark, *Aegle marmelos* seed oil, *Agapetes serpens* entire dried plant, *Albizia anthelmintica* bark, *Allium sativum* dried and fresh bulb, *Aristolochia bracteolate* dried leaf, *Artemisia sivesiana* dried entire

plant, *Balanites aegyptiaca* dried kernel, *Mangifera indica* (kernel), dried leaves and bark of *Melia azedarach*), dried fruit of *Myrsine africana* have all been reported to possess anthelminthic activities (Odegbemi, 2006; Ibrahim, 1992; (Kightlinger *et al.,* 1996; Middleton and Tatlock, 1998).

Current challenges to the use of plants as anthelmintics

A major challenge to the use of plants as therapeutic agents is that it does not follow western paradigms of scientific proof of efficacy and this forms the basis of the major argument against the use of traditional medicine today (Sofowora, 1982). Also significant are the seasonal availability of certain plants and the inconvenience of preparing or using some these remedies. Collection and preparation of some of these plant remedies can be very time-consuming. Also, each constituent may have to be found only in special habitats (Schillhorn van Veen, 1997). There is also the challenge of scarcity of herbal treatment following the occurrence of infectious epidemic diseases and often inadequate ethnodiagnosis owing to lack of pathophysiological understanding of disease processes, culminating in inappropriate or harmful prescription (Bizimana, 1994).

Conclusion

The market prediction for phytomedicine is great because 80% of the population in developing countries depend on herbal medicines. Traditional medicine needs support from the government for promotion and establishment of the biotechnology industry to aid in the standardization of already discovered herbal therapies. Several Nigerian indigenous plants have been reported to show potent anthelminthic properties.

It is therefore recommended that more research trials be carried out in this area because of the great socio-economic and socio-cultural advantages presented by plants as viable anthelmintics in Nigeria.

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