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Anthelminthic effect of some Medicinal Plants on Gastrointestinal Parasites - A Review

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ABSTRACT

Modernization coupled with poor storage format of ethno veterinary knowledge based on individuals' remembrance abilities and its transmission from generation to generation by word of mouth, has greatly endangered its survival and sustainability into the future. The resultant effect of which has been the realization of a great loss of very vital information. The rapid socio-economic, ecological and technological changes in people's lifestyles, has greatly led to the disuse or total loss of traditional. Therefore, workers in the fields of anthropology, veterinary sciences and pharmacology have focused on documentation of the traditional knowledge. Some recent information on ethno veterinary practices several researchers have undertaken studies to evaluate indigenous medicinal plants for their proclaimed anthelmintic efficacy. These traditional medicinal plants are easily available, effective anthelmintic agents, drives attention of people of developed as well as developing countries and cattle farmers consume several plants derived preparation to cure gastrointestinal parasite.

Keywords : Medicinal Plant, Gastrointestinal Parasite, Ethano Veterinary, Anthelminthic

I. INTRODUCTION

Parasites are of main concern in the medical field for centuries. Among them helminthes considered causing many disease like anemia, malnutrition, eosinophilia and majority of infections are nature of tropical countries (Bundy, 1994) which were spread to temperate areas due course of time. Parasites are capable to develop resistance to most of the available commercial medicines. Thus, creating a severe problem worldwide (Waller and Thamsborg, 2004). These drugs are unaffordable or inediquetly available to resource poor cattle farmers of developing countries (Hammond *et al.*, 1997). Due to this limitation most of the world population depends to greater extent on traditional medicinal preparations. Dependence on Traditional Veterinary Knowledge Resource-poor livestock farmers all over the world have limited access to modern disease prevention and treatment practices particularly in the areas with inadequate state sponsored health coverage facilities. They frequently depend on traditional knowledge for the management of animal health problems and to improve their productivity. The traditional knowledge of the livestock raisers (sedentary and nomadic) is often based on the ethno veterinary practices. Such practices and remedies, termed as "ethno veterinary medicine (EVM)" are claimed to be effective based on empirical evidence orally transmitted from one generation to the other. For that reason, EVM is a traditional system that local people, through trial-and-error and also deliberate experimentation, developed to keep their animals healthy and productive.

II. LITERATURE SURVEY

Majority of the EVM surveys and validation studies indicate much wider and effective use of plants as anthelmintics compared with other diseases/conditions (Iqbal *et al.,* 2004; 2005; 2006a,b,c; Jabbar *et al.,* 2007; Farooq *et al.,* 2008; Hussain *et al.,* 2008; Hussain *et al.,*2012). The tremendous use of plants as anthelmintics for the treatment of helminthiasis is attributed to its high prevalence and heavy production losses in third world countries (Dhar *et al*., 1982) due to poor management practices. Moreover, increasing problems of development of resistance in helminths (Waller, 1986) against anthelmintics, and chemical residual/toxicity problems have also led to the use of screening medicinal plants for their anthelmintic activity.

Ethno veterinary knowledge continues to be recognized at global level as a resource that reflects people's total commitment and experience in life, from origin through evolutionary stages to current situation. These experiences, stem from people's ingenuity, credulity and above all, perhaps, their insatiable curiosity that over many centuries, they accumulated the current rich and resourceful traditional knowledge that has been passed on from generation to generation by word of mouth, traditional songs, poems, drawings, paintings, stories, legends, dreams, visions and initiation ceremonies. This knowledge has been sketchily recorded in books stored in the same fashion as it is transmitted by means of practice or in the form of artifacts handed from father to son or from mother to daughter.

Many writers described the today's traditional medicine, as undoubtedly the oldest form of medicine and probably evolved simultaneously with the evolution of human beings. For instance, at around 3000BC horses, elephants, and other animals were highly regarded and were in good association with man as present-day in Sri Lanka and could be treated with Ayurvedic medicine. These associations were based on economic, cultural, social and religious beliefs attached to each type of animal, and it was during this time that veterinary medicine evolved specifically to take care of the health of animals, which were being domesticated. A glance at the existing literature reveals that the traditional knowledge embodied in ethno medicine, constitute yet an untapped resource of potentially useful information for possible deployment in sustainable animal health management systems in rural and pre-urban communities all over the world.

EVM mainly constitutes of indigenous plants of an area, which are readily accessible to the local communities. Plants have been used from ancient times to cure diseases of man and animals. There are a many plants which have been reported in literature for their medicinal importance. For example: *Caesalpinia crista* (Leguminosae; karanjwa), *Melia azedarach* (Meliaceae; bakain), *Saussurea lappa* (Compositae; qust-eshireen), *Morringa oleifera* (Moringaceae; sohanjna), *Trachelospermum jasminoides* (Apocynaceae; zard chambeli), *Butea frondosa* (Leguminosae; Dhak) etc. have been quite commonly used (Nadkarni, 1954). The medicinal properties ascribed to these plants include anthelmintic, antiperiodic, antipyretic, febrifuge, antiphlegmatic, antiflatulant etc. In addition, these plants have also been used to cure nervous problems, skin diseases, cough, rheumatism, chronic fever, eczema and dyspepsia. The fruit of *Mallotus philippinensis* (Euphorbiacea; kamala) has been used as an anthelmintic, cathartic, aphrodiasiac, lithotropic and styptic. It has also been used in external applications for the control of parasitic infections of the skin, as an antiseptic for ears and systemically for urinary disorders (Satyavati 1990). The British Pharmaceutical Codex (1934) and the British Veterinary Codex (1953) cite kamala as having anticestodal properties for man and dog. (Akhtar &

Ahmad, 1992). Various parts of *Lagenaria siceraria* (Cucurbitacae; kaddoo) have been used for different ailments. For example, pulp of its fruit to treat cough, as an adjunct to purgatives and antidote to certain poisons and for scorpion stings (Nadkarni, 1954), decoction of its leaves to treat jaundice (Chopra *et al*., 1956 and Said, 1969) and its seeds to treat tapeworm infections in children.

Fumaria parviflora (Fumariaceae; pit-papra or shahterah) is traditionally used as an antidiabetic, diaphoretic, diuretic, anthelmintic (Nadkarni, 1954; Chopra *et al*., 1956). *Nigella sativa* (Ranunculaceae; kalonji) is used on empirical grounds as an anthelmintic, stimulant and diuretic (Nadkarni, 1954; Said, 1969). The roots of *Morus alba* (Urticaceae; toot or tut) are considered as an anthelmintic and vermifuge, whereas root bark and stem bark are reported to be vermifuge and purgative. A number of medicinal plants have been used to treat parasitic infections in man and animals (Nadkarni, 1954; Chopra *et al*., 1956; Said, 1969).

In the search of plant based anthelmintics extracts of different medicinal plants have been tested for action against flat worms and round worms in vivo and *in vitro* and have been found to possess anthelmintic activity. Ethanolic extract of *Melia azadarach* tested against tape worm (*Taenia solium*) using Piperazine phosphate as standard drug and the activity was better against *Taenia solium* than that of Piperazine phosphate. (Szewezuk *et al*., 2003). The Alcoholic extract of *Melia azadarach* and *Trichilia Claussenii* shows greater anti parasitic efficacy on sheep gastro- intestinal nematode (Cala *et al*., 2012). An aqueous extract of *Artocarpus lakoocha* enhanced severe and rapid damage on Adult *Fasciola gigentica*. The effects are seen as tegument damage, lesion, Swelling and blabbing on surface (Saowakon *et al*., 2009). The flukicide activity of *Areca catechu*, *Erythrina indica* and *Zingibar officinale* were was observed against *Fasciola gigentica* by Jeyanthilakan et al. (2010). They found Areca extract caused severe histopathological effect like deformation of the body shape with absence of spines on the tegument, rupturing of testicular, uterine and intestinal branches and separation of tegument from cuticle, vacuolation of parenchyma. The extract of ginger caused flattening of fluke, separation of tegument and paralysis of flukes. Ginger shows antischistosomal activity causing abnormal Surface topography and tubercle Spine loss etc. (Mostafa *et al*., 2011). It is also used as anthelmintics purpose because its medicinal properties includes anti arthritic (Bliddal *et al*., 2000), anti migraine (Cady *et al*., 2005), anti inflammatory (Thomsom *et al*., 2002, Penna *et al*., 2003), Hypolipidaemic (Al-Amin *et al*., 2006), anti-nausea (Portonei *et al*., 2003). The crude powder of dry ginger showed anthelmintic activity in sheep (Iqbal. 2006). The chemical constituent isolated from ginger shows larvicidal activity against *Angiostrongylus cantononsis* and reduced movement and kill the larvae of *Angiostrongylus simplex* (Lin *et al*., 2010a&b). The crude aqueous extract of ginger show antischistosomal activity against *Schistosoma mansoni* showed partial loss of tubercle spines. Extensive erosion in tegumental region, lose in normal surface topography (Osama *et al*., 2011). The different concentration of plant crude extract of *Artemisia cina* were used *in vivo* and *in vitro* on sheep tapeworm *Moniezia* sps, and found many structure of parasite worm, were affected like scolex and microtriches of outer tegumental surfaces (Abdel *et al*., 2011).

The perennial legume *Serica lespedeza* of Eastern Asia shows remarkable anthelmintic efficacy offered as fresh (Min *et al*., 2004) or in the form of Hay (Shaik *et al*., 2004 and Lange *et al*., 2006). The use of extract of male fern (*Dryopteris felix*) against cestodes and trematodes cause severe damage to worms (Reinemeyer *et al*., 2001). An alcoholic extract of *Mallotus philppinensis* caused complete paralysis of *Fasciola gigantica in vitro* (Kushwaha *et al*., 2004). *Allium sativum* has shown anthelmintic action *in*

vitro against *Heterakis gallinae* and *Ascaridia galli* (Nagaich *et al*., 2000). In an *In vivo* experiment *A. sativum* has been demonstrated activity against strongyloids in donkeys (Sutton *et al*., 1999). The effect of alcoholic extract of *Allium sativum* and *Piper longum* on amphistome *Gigantocotyle explanatum* resulted complete paralysis to the worm (Singh *et al*., 2008). The effect of dried powder of *Allium sativum* extract was seen against *Fasciola gigantica*. *In vitro* study revealed that extract caused deformation of the tegument, Seperation of tegument from cuticle, paralysis and mortality of *Fasciola gigantica* (Kumar and Singh 2014).

The extract of *Canthium mannii* (Rubaceae) was shown ovicidal activity on immature eggs of *Ancylostoma caninum* (Wabo *et al*., 2006). The Oil of *Chenopodium ambrosoides* consist of monoterpene which is the active principle of this plant, used against nematodes parasite in sheep shows reduction in population (Kato, 1997) and ovicidal and egg hatching inhibition effect on parasite (Ketzis *et al*., 2002). The efficacy of *Balanites aegyptiaca* fruits Studied on Adult worms *Fasciola gigantica*. The ethanolic extracts and triclobendezole found to induced tegumental alteration and destruction of the body surface of *F. gigantica* (Ebeid *et al*., 2011). The efficacy of *Balanites aegyptiaca* tested against *Toxocera volurum* by Shalaby *et al*. (2012a). The histopathological changes on the body surface of parasites are quite similar as deformity caused by albendazole. The extract induced dose dependent response of flukes. They observed slight swelling of cuticle at lower dose which increased to large vacuolated swelling in hypodermis at higher concentrations, muscles separations and vacuolation in lateral cords, wrinkled cuticle and complete disruption of muscle cells. The scanning electron microscopic study of treated flukes revealed wrinkled cuticular surface of lips, deformed sensory papillae and lips. The fruit extract of desert date- *Balanites aegyptiaca* found to effective against *Fasciola gigentica*, *Schistosoma japonicun* (Koko *et al*., 2000), *Toxocara vitulorum* parasite of cattle (Shalaby *et al*., 2009; Hatem *et al*., 2012) and *Coenorhabditis elegans* (Gnoula *et al*., 2007).

In another study, two well known plants Sage (*Salvia officinale*) and thyme (*Thymus vulgaris*) found to be efficacious on cestodes *Echinococus granulosus* (Mcmanus *et al*., 2003). The oil of both the plants was found to inhibit the growth of a wide range of organism that causes various diseases (Akin *et al*., 2010 and Karata *et al*., 2010). The alcoholic extract of above plants used *in vitro* to study viability of *E. granulosus* and results were both have promising source of potent antiprotoscolices (Yones *et al*., 2011).

The leguminous Root crop of North east India *Moghnia vestita* used to cure intestinal helminthes infection by native tribal people. The crude extract of plant tuber exported to be effective against digeneans fluke causing tegumental alteration and deformity (Roy *et al*., 1996). The crude extract and genistein, an active principle isolated from peel of tuber, when tested against live parasites, revealed complete immobilizations of the trematode (*Paramphistomum* sps. from cattle) and cestodes (*Raillietina echcinobothrida*) (Tandon *et al*., 1997). The extract of *Stephania glabra* and *Trichosanthes multiloba* were tested against various helminth and nematode parasites and study demonstrated that the test plant materials have deleterious effect on *Raillietina echcinobothrida* and *Fasciola buski.* In ultrastructural studies, disorientation of the microtriches, spines and scales was observed along with severe distortion and deformity of the tegument, breakage and sloughting off the tegumental surface. In treatments with *Stephania glabra* showed pronounced effect on cestodes and trematodes; a dose dependent gradual decline in physical motility was observed in *Fasciola buski* and *Raillietina echcinobothrida* (Tandon *et al*., 2004). Roy *et al*. (2012) studied the anthelmintic property of *Alpinia nigra* against *Fasciola buski*

comparable to reference drug Prazinquental and revealed that on the exposure to different concentrations of plant extracts as well as PZQ, the parasites became immobile followed by flaccid paralysis and death. Also plant extract were found to reduce activity of AlkPase, ATPase. The treated worms showed deformed body with shrunken and wrinkled tegumental surface with extensive pit formation and scarring due to sloughting off of the spines. Ventral sucker also deformed at great extent. The cestode parasite, *Raillietina echinobothrida* and the trematode, *Gastrothylax crumenifer* were exposed to the ethanolic root peel extract of *Potentilla fulgens*, an antiparasitic local medicinal plant of Meghalaya, India, to evaluate the anthelmintic efficacy of the plant. The result suggests that phytochemicals of *P. fulgens* have anthelmintic potential. The plant extract was shown to cause reduction in the staining activity of the tegumental enzymes. In biochemical quantification also the enzyme activities in *P. fulgens* and PZQ treated flukes were found to be reduced significantly compared to the control ones. Other plant extract such as that of *Alpinia nigra* shoot-extract showed similar effect on AcPase, AlkPase and ATPase activities of *Fasciolopsis buski* (Roy and Swargiary, 2009). The effects of the test plant on the motility and survival of the parasite and alterations caused in their tegumental architecture clearly indicate that the phytochemicals of *P. fulgens* root bark may act as potential vermicide.

The extracts of plant effective on animal and human parasite like *Ostertagia, Nemotoderus, Taenia Ascaria and Fasciola* (Shivkar *et al.*, 2003). Even the flower of this plant evaluated *in vivo* and *in vitro* and found good anthelmintic quality against nematodes (Iqbal *et al.*, 2005). The seed extract *Xylopia aethiopica* is found to be effective on rat hook worm *Nippostrogylus brasiliensis* (Suleiaman *et al.*, 2005). The spice Ajowan's seed extract was screened for anthelmintic property in sheep (Lateef *et al.*, 2006).

Screening of other plants alcoholic extract of *Allium sativum* at low concentration of 1.0 mg/ml causes high mortality of *Cotylophoron cotylophorum* whereas albendazole induced mortality at slightely higher concentrations and duration (Nahla *et al.*, 2012). The *Gigentocotyle explanatum* treated with alcoholic extracts of *A. sativum* and *Piper longum* shows remarkable paralysis within the 30 minutes of incubations and alcoholic extracts of *A. Sativum* produced significant reduction in the frequency and amptitude of contractile activity of the amphistome at 1000 and 3000 mg/ml bath concentrations (Singh *et al.*, 2008). Amin et al. (2009) documented effect of water extracts of 20 plants against gatrointestinal parasite. The study includes various extracts and found that lower concentrations are less efficacious than higher concentration. These plants had higher significant activity (90-100%) against adult gastrointestinal helminths *in vitro* were neem, tobacco, betel leaf, pineapple, turmeric, jute, garlic, papaya, bitter guard etc.

The effect of crude extracts of *Actocarpus lakoocha* on adult *Fasciola hepatica* was evaluated. The research shows extracts were reduced the parasites motility at 3hr incubation and kill the parasites between 12 and 24 hr incubation and sequentially induced changes in tegumental surface like swelling, blebbing, ruptured surface. (Saowaken *et al.*,2009). The 1% essential oil of *Cymbopogan nardus* and *Azadirachta indica* showed 60% mortality and 40% mortality of *Fasciola gigentica* (Jayenthilakan *et al.*, 2010). The concentrations of *Areca catechu* and *Zingibar officinale* given *in vitro* exposure demonstrated that higher concentration induced death in fluke more rapidly as comparison to lower concentrations (Jayenthilakan *et al.*, 2012).

Sumaia *et al.*, (2012) worked *in vitro* with extracts of *Capparis decidua* and *Moringa oliefera* on *Fasciola gigentica* and also compared with Albendazole. This study observed that aqueous concentration of *C. decidua* not showed any similar activity as alcoholic

one. Here albendazole exhibit strong *in vitro* efficacy on adult parasite. In this experiment, Albendazole indicate anthelmintic potency at higher concentration. No anthelmintic effect of extracts of *M. oliefera* leaves were detected against adult stages between the hours of incubation times in the concentration in which they tested.

Roy et al. (2010) worked on root peel extract of *Potentilla flugans* on *Gastrothylax cruminifer* with the crude ethanolic concentrations. They also compared the results with Praziquantel and results were sudden contraction of parasite followed by paralysis and death. The results were favourable with the ascending concentration of plant extract. The anthelmintic property of *Lasimachia ramosa* studied on *Raillietina echinobothrida* by Challum et al. (2010) with different concentrations. The results indicated that the plant extracts showed dose dependent anthelmintic activity which was higher at 50mg/ml concentration.

The leaf methanol extract of *Ricinus communis* were studied *in vitro* against *Paramphistomum cervi* and found to have potential anthelmintic effect on adult and larva of *P.* C*ervi* (Zahir *et al.,* 2009). Swarnakar et al. (2014) studied the anthelmintic effect of *Trigonell foenum-graecum* with aqueous extracts of 130mg/ml and achieved 100% mortality of *Gastrothylax cruminifer* within 5hr of incubation. They found that extracts induced detachment, discontinuation, blebbing and other tegumental alterations in *Gastrothylax cruminifer*.
Dasgupta and Roy (2010) studied effect of crude methanolic extracts of *Acacia oxyphylla* with synthetic drug praziquantal against *Raillietina echinobothrida*. The study showed that control worms remained alive for 72 hr, whereas treated parasites went into a paralytic state followed by death within 5-8 hr of incubations and parasites treated with prazinquental survived for about 7-10 hrs.

III. CONCLUSION

Ethno veterinary knowledge continues to be recognized at global level as a resource that reflects people's total commitment and experience in life, from origin through evolutionary stages to current situation. These experiences, stem from people's ingenuity, credulity and above all, perhaps, their insatiable curiosity that over many centuries, they accumulated the current rich and resourceful traditional knowledge that has been passed on from generation to generation by word of mouth, traditional songs, poems, drawings, paintings, stories, legends, dreams, visions and initiation ceremonies. Many writers described today's traditional medicine, as undoubtedly the oldest form of medicine and probably evolved simultaneously with the evolution of human beings. A glance at the survey of literature reveals that the traditional knowledge embodied in ethno medicine using various plant extracts, oils and isolated active principles for in-vivo and in-vitro anthelmintic studies to constitute yet an untapped resource of potentially useful deployment in sustainable animal health management systems in rural and pre-urban communities all over the world. To conclude, in future studies there is need for phyto chemical, clinical and studies on molecular level of action. Efforts should be made to formulate best alternative herbal preparations to replace the synthetic drugs currently being used.

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