Recent Advances in Disease Control by Natural Products in Animals and Birds in Bangladesh

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Abstract

Use of herbs for curing diseases is well documented in the history of all civilizations. Because of the increasing reports of the possible hazards in using synthetic products in animals, natural products are rapidly establishing their credibility. At least 60 different varieties of plants, herbs and shrubs grown in Bangladesh have recognized medicinal properties, and are being used by Village Doctors like Hekims and Quacks for treating diseases in man and animals. A number of natural products are commercially available in Bangladesh most of which are used as feed additives, though few have antibacterial and anticoccidial use. Recent studies revealed that ethanol extract of Ata (*Annona reticulata*) at 2% concentration as spray showed highest efficacy (100%) followed by aqueous extract of Bishkatali (*Polygonum hydropiper*) against *Boophilus microplus*. Ethanol extracts of Neem (*Azadirachta indica*), bitter gourd (*Momordica charantia*) and Padmagulancha (*Tinospora tomentosa*) were highly effective against common stomach worm *Haemonchus contortus* in both *in vitro* and *in vivo* studies. Bitter gourd (*Momordica charantia*) has been found very effective against chicken coccidiosis. Birds receiving bitter gourd powder with feed had almost a similar weight gain compared with uninfected control chicks, and both these groups of chicks gained significantly higher ($P<0.05$) weight compared with chicks receiving sulphaclozine sodium. Anticipating the bright prospect, our research is now targeted mostly on the use of different plants against different parasitic infections in animals and birds. This presentation will cover the details of the currently used natural products in Bangladesh and our efforts in revealing the greatness of these natural products.

Introduction

The plant kingdom is a rich source of botanical anthelmintics, antibiotics and insecticides (Satyavati *et al.*, 1976; Lewis and Elvin-Lewis, 1977). Use of herbs for curing diseases is well documented in the history of all civilizations. Despite the tremendous success in research in medicine and discovery of newer drugs, herbs as medicine still has a great role especially amongst the rural people in the third world countries in particular. Because of the increasing reports of the possible hazards in using synthetic products in animals grown for human consumption, natural products are rapidly establishing their credibility as feasible alternative in the recent years. However, there are arguments that natural products may not be safe or equally effective or may not comply with pharmaceutical grade products. Some of these are very valid questions and need to be answered before widespread acceptance of these products. Bangladesh has a long history of using different plants for treating diseases in animals and man. At least 60 different varieties of plants grown in Bangladesh have recognized medicinal properties, and are being used by Village Doctors like Hekims and Quacks for treating diseases in man and animals. But very little attention has been given on the study of these plants as of their efficacy in curing and/or controlling disease in animals and man, and of course the safety in using these products in Bangladesh. This communication will cover the recent studies done in the Department of Parasitology of Bangladesh Agricultural University, Mymensingh, Bangladesh. However first of all the products those are being commercially available in Bangladesh will be mentioned with a brief note about their use in animal medicine.

Herbal products in current use:

A number of local pharmaceutical industries are either producing or importing herbal drugs for use in animals and birds in Bangladesh. Some of these are reported to have a good efficacy. Following is the table listing the herbal drugs available in Bangladesh with their uses and dosage (Table 1).This could be a good beginning, only if steps are taken to study the efficacy and safety of these products in extensive field trial.

Bitter gourd against chicken coccidiosis:

Increasing report of resistance against the commonly used sulphonamides (Siddiki *et al*, 2000) prompted this work in which we used bitter gourd (*M. charantia*) in chickens experimentally infected with *Eimeria tenella*. Dried bitter gourd was pulverized, and a group of chicks infected with 10^4 sporulated oocysts each at the age of 26 days received this powder in feed from 3-6 day post infection @ 10 gm/ kg. Results were assessed on the basis of weight gain and oocysts output of birds (Table 2). Chicks received bitter gourd had almost similar weight gain ($P>0.05$) with that of uninfected control chicks, and both these groups of chicks gained significantly higher ($P<0.05$) weight compared with chicks received Esb_3 ® (sulphaclozine sodium). Chicks receiving bitter gourd had a relatively higher oocysts count ($p<0.01$) compared with chicks treated with Esb_3®, but lower than the untreated chicks, although statistically it was not significant ($p>0.05$). Despite relatively large oocysts counts, significantly higher weight gain in chicks receiving treatment with bitter gourd is very interesting, but difficult to explain. Products bitter in taste are reported to enhance the immune response in chickens (Deepika *et al.*, 2002). Therefore it is possible that bitter gourd, because of its bitter taste, might have contributed in a better immune response in the birds. This preliminary study suggests that bitter gourd can be a good alternative to the common coccidiostats. It is also highly economic, since only a fraction of the cost of sulphonamides is needed. However, further study for titration of the doses and on any possible adverse effect on the chickens needs to be carried out.

Herbs against the common cattle tick:

Some synthetic acaricides have residual effects

Table 1. List of commercially available herbal products for use in animals and birds in Bangladesh

Trade name	Indications
Hepavet	(Herbal Liver tonic) as Feed Supplement (Poultry: 1 ml/liter water; Large animal: 0.5ml/kg wt)
Enzyvet liquid	Digestive enzyme as feed supplement (Poultry: 1 ml/liter water; Large animal: 0.5ml/kg wt)
Herbomix-DS	Feed grade Liver tonic (125 g/ton feed)
Galactovet	Milk Enhancer (1 g/10 kg wt)
Ayucal-D	Herbs + V- D to prevent cannibalism &improve egg shell quality (5g/100 chicks; 10g/100 grower; 15g/100 layer)
Toxiroak	Mold inhibitor, Toxin binder, Mycotoxin biosynthesis inhibitor, Mycotoxin bio-neutralizer (100-200g/100 kg feed)
Superliv	Increases efficiency of liver, digestive tract.Act as a renal tonic (1ml/1-2 liter)
Livfit Vet	Increases detoxification capacity of liver (5g/100 chicks10g/100 grower, 15g/100 layer)
Herban Liquid	Increases feed intake, FCR, egg production, hatchability and fertility (Poultry: 3ml/10 L water, Large animal: 1ml/10kg wt)
Coxynil- Feed Additive	Anticoccidial (250-300g/Ton feed)
Respowell - Feed additive	Organic broad-spectrum antimicrobial against Mycoplasma, Staphylococcus, Streptococcus, Salmonella , Campylobacter, Pasteurella, Actinobacillus, Clostridium,
Fertiwell- Feed Additive	Active against Streptococcus and Staphylococcus (Chicken: 1kg/ton, Bull: 100mg/kg wt)
Growell -Feed Additive	Immune stimulant, Toxin remover, Growth promoter, Anti-stress, Liver and kidney stimulant and Productivity enhancer.

Table 2. Mean weight gain and oocysts output of chickens infected with 10^4 oocysts of *E. tenella*.[1]

Group	Bitter gourd Powder	Metronidazole (Filmet®)	Sulphonamides (Esb_3®)	None	Control (uninfected)
Mean wt. gain (gm)	$84.41^a + 9.98$	$63.60^b + 13.44$	$67.96^b + 13.17$	$67.42^b + 12.92$	$85.12^a + 7.36$
Total oocysts out put x 10^6	$39.06^a + 7.80$	$40.79^a + 5.55$	$16.33^b + 5.33$	$66.44^a + 12.49$	0

[1]Rahman, *et al. 2005*

Table 3. Acaricidal efficacy of aqueous extracts (2%) of different plant materials against adult *B. microplus* after 72 hours exposure (N=15)[1]

Name of the plants	Scientific name	Application	%Mortality
Neem	*Azadirachta indica*	Spray on	86.67
		IFP	80
Bishkatali	*Polygonum hydropiper*	Spray on	93.33
		IFP	86.67
Ata	*Annona reticulate*	Spray on	86.67
		IFP	80
Sharifa	*A. squamosa*	Spray on	80
		IFP	60
Durba	*Cynodon dactylon*	Spray on	80
		IFP	53.33

[1]Nahar *et al*, 2005

Table 4. Acaricidal efficacy of ethanol extracts (2%) of different plant materials against adult *B. microplus* after 72 hours exposure (N=15)[1]

Name of the plants	Scientific name	Application	(%) Efficacy
Neem	*Azadirachta indica*	Spray on	66.67
		IFP	60
Bishkatali	*Polygonum hydropiper*	Spray on	80
		IFP	66.67
Ata	*Annona reticulata*	Spray on	100
		IFP	80
Sharifa	*A. squamosa*	Spray on	86.67
		IFP	53.33
Durba	*Cynodon dactylon*	Spray on	60
		IFP	46.67

[1]Nahar *et al*, 2005

and are accumulated in environment, which induce resistant strains of pests including the tropical cattle (O' Sullvian and Green, 1971; Howell, 1977). The acaricidal effects of various plants have been studied in many countries of the world (Khudrathulla and Jagannath, 1998; Mulla and Su, 1999; Abdel-Shafy and Zayeed, 2002). This was the first attempt to study the acaricidal effects of a few indigenous plants of Bangladesh (Nahar, *et al* 2005). Leaves of Neem (*Azadirachta indica*), Bishkatali (*Polygonum hydropiper*), Ata (*Annona reticulata*), Sharifa (*A. squamosa*) and Durba ghas (*Cynodon dactylon*) as paste, aqueous and ethanol extracts were tested *in vitro* against *B. microplus*, applied either as thin layer of paste or as spray or as impregnated filter paper. Fresh leaves were made into paste with pestle and

Table 5. Acaricidal efficacy of freshly prepared pastes of different plant materials against adult *B. microplus* after 72 hours (N=15)[1]

Name of the plants	Method of application	% Mortality
Neem	Thin layer of paste	60
Bishkatli	Do	80
Ata	Do	86.67
Sharifa	Do	60
Durba	Do	80
Control	Moistened with water	0

[1]Nahar *et al*, 2005

Table 6. Percent non-motile (dead) adult (A) and infective larvae (L_3) of g/i nematodes exposed to different increasing concentrations of aqueous extracts *in vitro*[1]

Name of Plants		% mortality @ 100 mg/ml	
Common name	Scientific name	A	L_3
Jute leaves	*Corchorus olitorious*	92*	84
Pineapple leaves	*Ananas comosus*	100*	53
Amrul	*Oxalis corniculata*	100*	18
Biskathali leaves	*Polygonum hydropiper*	100*	15
Padmagulancha	*Tinospora tomentosa*	96*	82
Karola	*Momordica charantia*	100*	70
Neem leaves	*Azadirachta indica*	92*	36
Hatishur leaves	*Heliotropium indicum*	100*	67
Katakhura	*Amaranthus spinosus*	100*	10
Lazzabati	*Mimosa pudica*	100*	26
Garlic whole	*Allium sativum*	100*	56
(Morantel citrate)		100*	100*
Albendazole		100*	100*
PBS		04	04

[1]Rahman, 2004

mortar. Ten gram powder made from dried plants was suspended in 100 ml distilled water or ethanol, filtered and concentrated to 10 ml by evaporation in water bath. Extracts were used in 0.5%, 1% and 2% concentrations and the percent mortality of the ticks was recorded at 12, 24 and 72 hours. Ethanol extract of Ata at 2% concentration showed highest efficacy (100%) followed by aqueous extract of Bishkatali (93.33%) at same concentrations and ethanol extract of Ata at 1% concentration in spray on method (Tables 3-5).

Herbs against the common stomach worm:

Benzimidazole and Probenzimidazole groups of anthelmintics are widely used in Bangladesh for controlling parasitic infections in animals. Indiscriminate and unscrupulous use of these anthelmintics leads to the development of resistant strains of helminths (Karim, 2005). Screening of medicinal plants for their anthelmintic activity got a momentum in the recent past (Akhtar *et al.* 2000), though very little attention has been given on this in (Mostofa, 1983; Begum, 1997). This prompted a study on the use of aqueous and ethanol extracts of twelve indigenous plants for *in vitro* and *in vivo* anthelmintic effect against gastrointestinal nematodes of goat origin (*Haemonchus contortus, Trichostrongylus* spp., *Trichuris* spp., *Strongyloides papillosus, Oesophagostomum columbianum, Cooperia* spp. and *Bunostomum trigonocephalum*) and their infective larval stage (L_3) obtained from *in vitro* culture (Rahman, 2004) (Tables 6 and 7).

Table 7. Percent non-motile (dead) adult (A) and infective larvae (L_3) when exposed to an increased concentration of ethanol extract of indigenous plants *in vitro*[1]

Name of Plants		% mortality @ 50 mg/ml	
Common name	Scientific name	A	L_3
Jute leaves	*Corchorus olitorious*	100*	82.0
Pineapple leaves	*Ananas comosus*	100*	95.75*
Amrul	*Oxalis corniculata*	88	47.75
Biskathali leaves	*Polygonum hydropiper*	92*	49.0
Padmagulancha	*Tinospora tomentosa*	100*	100*
Karola	*Momordica charantia*	100*	100*
Neem leaves	*Azadirachta indica*	100*	100*
Hatishur leaves	*Heliotropium indicum*	96*	80.0
Katakhura	*Amaranthus spinosus*	100*	80.75
Lazzabati	*Mimosa pudica*	90*	60.75
Garlic whole	*Allium sativum*	100*	81.0
(Morantel citrate)		100*	100*
Albendazole		100*	32
PBS		07	3.25

[1]Rahman, 2004

Selected plants were processed for use as mentioned earlier. Aqueous and methanol plant extracts at various concentration (10, 25, 50, 100 mg/ml) levels were screened by using both adult worms and L_3 stage larvae. Twenty five adult worms (both male and female) or 100 L_3 in 200 µl PBS was added with 800 µl of extracts at different concentrations, after 3 hrs at room temperature, the percent non- motile (dead) parasites were counted.

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