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Research Article

Field Evaluation of Some Selected Medicinal Plants for the Treatment of Piglet Diarrhoea In Ghana

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ABSTRACT

Piglet diarrhea is one of the major causes of huge losses facing the pig industry in West Africa. The problem of limited access to veterinary services and drugs by low-income farmers, coupled with a global rise in antibiotic resistance has necessitated research into identifying comparably efficacious, economical and readily available phyto-genic extracts which could serve as alternatives to antibiotics. In this study, a field evaluation of extracts of three medicinal plants: *Picralima nitida*, *Ficus exasperata*, and *Khaya senegalensis* were investigated for their individual antidiarrheal activities in management of piglet scours in Ashanti Region of Ghana. Aqueous decoctions of the stem barks of *F. exasperata* and *K. senegalensis*, and seeds of *P. nitida* were extracted and concentrated into 5% and 10% w/v preparations. Piglets with non-induced diarrhea were recruited and divided into groups which were treated with extracts of specific concentrations and monitored till cessation of the diarrhea. The study revealed that extracts of all three medicinal plants, in the concentrations administered, portrayed clear evidence of efficacy; and significantly inhibited the diarrheal course in the piglets. More than 70% of the subjects achieved complete cessation of the diarrhea following treatment with *P. nitida* 10% at 30-35 hrs; *P. nitida* 5% at 49-54 hrs; *F. exasperata* 10% at 54-59 hrs; *F. exasperata* 5% at 54-59 hrs; and *K. senegalensis* 10% at 49-54 hours. Comparatively, the different extracts showed varying degrees of efficiency in the treatment of diarrhoea in piglets; and the highest efficiency and potency was with *P. nitida* 10%

Keywords: Piglets, Diarrhoea, *Picralima nitida*, *Ficus exasperata*, *Khaya senegalensis*

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INTRODUCTION

The study of medicinal plants by man has taken cognizance of observation of animals ingesting rarely-eaten plants in unfavourable conditions (Brander, 1931; Riesenber, 1948) such as ingestion of *Hibiscus subdariffa* by animals with retained placenta (Huffman, 2003), and *Diospyros lotus* in animals with diarrhea (Yousfzai *et al* 2010). Ethnoveterinary medicine being defined as traditional knowledge, skills, and practices, relating to the preservation of animal health, goes way back into history as evidenced by records found during tomb excavations, written records on walls of temples and medical papyrus (Davidovi *et al* 2012).

In modern times, even with varied options available in orthodox therapy of disease, there is a global interest in the use of herbal extracts in treatment of diseases. About 70% of the

total global population of food animals, 9.1% of poultry, 5.3% of dogs and 4.3% of dogs are treated through ethno-veterinary practices (Davidovi *et al* 2012). Ethno-veterinary medicine is widely practiced in many developing countries e.g. Ghana, Nigeria, etc. in both the livestock and poultry industries (Alawa *et al* 2002).

In Ghana, the livestock industry is a major feature in the agricultural sector, and contributes about 7% to the agricultural gross domestic product. The total population of pigs in Ghana as at 2000 was 3,000,000 (SRID 2010). One of the major problems facing the pig industry in the country is piglet scours or diarrhea which is a major cause of piglet mortality. Piglet diarrhea could either be infectious or non-infectious in etiology. The major infectious causes of piglet diarrhea include *E. coli* (Francois *et al* 2000; Ngeleka *et al*

2003) *Clostridium sp.*, (Ngeleka *et al* 2003) rotavirus and coronavirus (Vondruskova *et al* 2010). Non-infectious causes of piglet diarrhea include nutrition (Laine *et al* 2008), age at weaning (Nabuurs, 2015) and other managerial problems (Vondruskova *et al* 2010).

Currently, the most popular orthodox therapy of piglet diarrhea is aimed at elimination of infectious agents with antibiotics (Bhandari *et al* 2008). However, animal handlers use varied approaches in treating piglet diarrhea in Ghana; including the use of coffee in drinking water (Lans *et al* 2007), or the use of activated charcoal as recorded by Veterinary Service Department in Ghana. Ethno-veterinary practice in developing countries, however, presents various problems including lack of scientific basis, inconvenience in the use/preparation of remedies, seasonal availability of certain plants and difficulties in standardizing herbal remedies (Kalawole *et al* 2007).

Several plants, though recognized for their medicinal properties and use in human practice (Alawa *et al.*, 2002; Anowi *et al.*, 2012; Erharuyi *et al* 2014), are not yet incorporated into dispensation of veterinary services due to the fact that they have not been clinically experimented on farm and pet animals. Of these plants are *Khaya senegalensis*, also known as dry zone mahogany (Makut *et al.*, 2007), of which extracts from the leaves and stem bark are used for treatment of diarrhoea, dysentery and wound infections in man (Makut *et al* 2008). The same goes for *Ficus exasperata* which is also widely distributed in tropical Africa and Asia (Anowi *et al.*, 2012). Extracts of stem bark and leaves of the plant are used in the management of wounds, boils and burns (Amponsah *et al.*, 2010), rashes, leprosy sores, itching, ring worm infestation (Amonkan *et al.* 2013; Anowi *et al.*, 2012; Lawal *et al.*, 2012), treatment of dysentery and as an anti-ulcer remedy (Adebayo *et al.*, 2009). The root extracts of the plant are also used in the treatment of urinary tract diseases e.g. gonorrhoea, as well as tuberculosis, cough and helminthiasis in Ghana.

Picralima nitida on the other hand, is widely distributed in high deciduous forests of west-central Africa (Erharuyi *et al.*, 2014). Bark decoctions are used in the treatment of malaria fever, stomach pains, diarrhea, dysentery, diabetes and against helminthosis (Takin *et al.*, 2013). These plant and others had been evaluated experimentally in laboratory animals but there is few evidence of their applicability in swine practice hence this study seeks to evaluate the efficacy of extracts of *Khaya senegalensis*, *Ficus exasperata* and *Picralima nitida*, in the management of piglet scours on the field, ascertain the efficiency of the extracts and establish optimal concentrations for their use in veterinary practice.

MATERIALS AND METHODS

Source of extracts: Stem barks of *Ficus exasperata* and *Khaya senegalensis* were obtained from the physic garden of the Faculty of Pharmacy and Pharmaceutical Sciences (FPPS), KNUST, and seeds of *Picralima nitida* were obtained from the Forestry Commission, Sunyani, Ghana. These items were identified and authenticated at the Department of Herbal Medicine, FPPS, and a voucher specimen was deposited at the herbarium of the same department.

Preparation of extracts: All plant materials were washed and dried in an oven at a temperature of 40°C. The materials were pounded separately into a fine powder using a mortar and pestle and stored in plastic bags till they were needed. 20g of the dried powder was added to 100ml of distilled water and warmed over a water bath with intermittent shaking over a period of 30 minutes. The maceration was cooled and filtered through a filter paper. The extraction was made thrice on the macerate. The filtrate obtained was concentrated under vacuum using a rotary evaporator at 80 degree Celsius until obtaining a dry extract and the yield was then calculated. A 5% and a 10 % w/v of each of the various samples were prepared.

Study area and population

Study Location : The Ejisu-Juabeng Municipality, located in the Ashanti Region, was chosen as the study location because it has been determined to be the highest pig-producing Assembly amongst the 226 District Assemblies in the country with a strong Pig Farmers Association (Plate 1). The municipality lies in the central part of Ashanti Region, within latitude 1 15'N and 1 45' N and longitude 6 15'W and 7 00'W, occupies a land area of 582.5 km², and shares boundaries with six districts in the region. The district capital is Ejisu (Ghana Statistical Service, 2014).

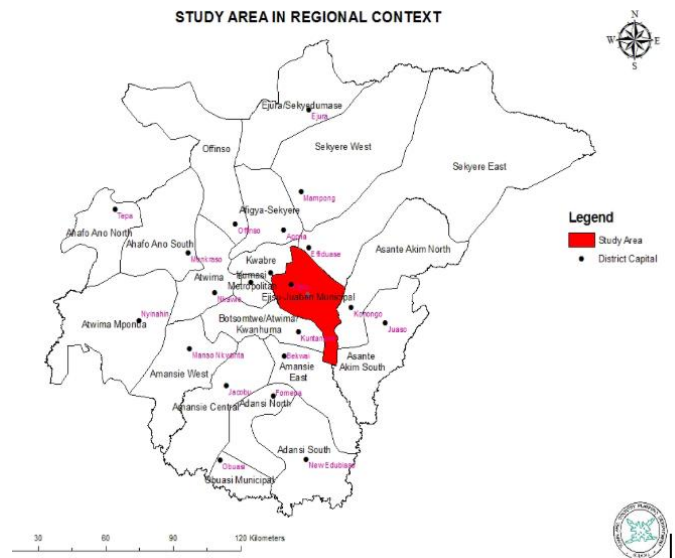


Plate 1:

Ejisu-Juabeng Municipality, located in the Ashanti Region

Selection of farms and subject used: In this clinical trial, selection of farms relied heavily on the good-will and motivation of farmers and recruitment of farms was strictly based on voluntary cooperation of farmers. The selected farms had to be of the intensive confinement type; and with a good record keeping system. A total of 25 farms were selected across the length and breadth of the Municipality.

Study Population: This clinical study is designed to include all piglets (age 0 to 12 weeks) with diarrhoea in the selected farms and any piglet that was registered to have come down with piglet diarrhea was recruited onto the clinical trial.

Study protocol: This study was designed as a prospective, controlled experimental study. Two concentrations – 5 and 10% w/v – of each herbal extract were used for treatment. Each cohort that was recruited was divided into two groups. One group was treated with one plant extract of a specific concentration; whilst the other group was given an orthodox medication in consultation with the in-charge veterinarian. All the drugs were administered per os.

Effect of the herbal extracts was evaluated by comparing results with those recorded after treatment with an orthodox medication.

Statistical Analysis: The time frame for antidiarrhoeal effect for each herbal extract in a specific concentration was calculated by subtracting the time of onset from the time of cessation of diarrhoea in a subject.

Data analysis of the raw data was done using software, SPSS (Chi square) with confidence level at 95% and $\alpha=0.05$

RESULTS

The group administered aqueous extracts from seeds of *Picralima nitida*, and from stem bark of *Ficus exasperata* and *Khaya senegalensis* significantly ($p < 0.005$) had the diarrhoea inhibited (Figure 2) in the piglets. This antidiarrhoeic effect was dose dependent in each extract (Table 1).

From Table 1, Similar results was also found with extract of *Ficus exasperata*, where both 10% and 5% concentrations of the extract which inhibited the diarrhoea at approximately the same time at 50-54 hours in 80 and 82% of the subjects as compared to cessation of diarrhoea at 55-59 hours in 70 % of the subjects using Sulphadimidine.

Khaya senegalensis extract was limited to 10% concentration due to some side effects noticed which included nausea, vomiting and lethargy, however diarrhoea ceased in 87.5% of the subjects at 49-54 hours.

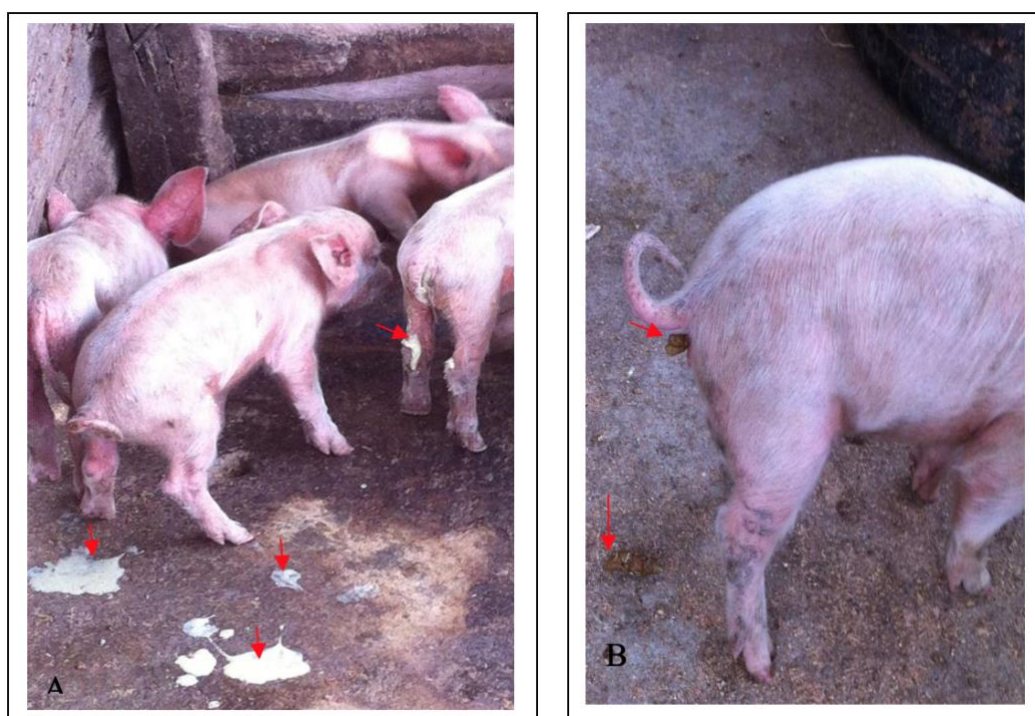


Plate 2.

Images showing change in consistency of stool before and after treatment.

A – piglets with diarrhoea (arrows) before treatment

B – a piglet with solid stool (arrow) after treatment with medicinal extract.

Table 1

Treatment and efficacy of three extracts in piglet diarrhoea

	PN 10%	PN 5%	Coliprajjet	FE 10%	FE 5%	Sulfadimidine	KS 10%	KS 5%	Enrovet
Number of recruits	10	10	5	12	10	5	8		2
Age (days)	17	14		15	18		17		
Average weight (kg)	6	5.2		5.1	5.7		6.3		
Solid stool in 70% of subjects	30-35hrs (80%)	49-54hrs (90%)	25-30hr (100%)	54-59hr (83.3%)	54-59hr (83.3%)	54-59hrs (80%)	49-54hr (87.5%)		30-35hr (100%)
P value	0.0000	0.0001		0.0000	0.0000		0.0000		

PN – *Picralima nitida*;

FE- *Ficus exasperate*;

KS- *Khaya senegalensis*

DISCUSSION

This study described the field evaluation of the antidiarrhoeic effect of the aqueous extracts from seeds of *Picralima nitida*, and from stem bark of *Ficus exasperata* and *Khaya senegalensis* in piglets. This antidiarrhoeic effect was dose dependent in each extract as shown in Table 1 which compared favourably with standard drugs Coliprajel, Sulphadimidine and Enrovet often used in the treatment of the condition in Ghana.

This finding of the dose dependent effect of *P. nitida* further corroborate the earlier works that reported its antimicrobial activity (Alawa et al., 2012) and anti-diarrheal and anti-inflammatory activities (Erharuyi et al., 2014). Similar results was also found with extract of *Ficus exasperata*, where both 10% and 5% concentrations of the extract inhibited the diarrhea comparable to that obtained with 70 % of the subjects using Sulphadimidine. The antidiarrhoeic effect of *Khaya senegalensis* extract was limited to 10% concentration due to some side effects noticed which included nausea, vomiting and lethargy. The anti diarrhoic effect observed in the selected plant may be associated with the known antibacterial effect of the extracts (Makut et al 2008, Adebayo et al., 2009, Erharuyi et al., 2014). This is the first report on the use of extract for treatment of diarrhea in veterinary subjects. In conclusion, this study clearly showed that *Picralima nitida*, *Ficus exasperata* and *Khaya senegalensis*, plants can be useful for the treatment of piglet diarrhea, however an extensive clinical trial on *khaya senegalensis* to reveal the full extent of its acute and chronic toxicities should be done and clinical appraisal of efficient dosages for use in clinical veterinary practice should be done.

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