



EVALUATION OF THE EFFECTIVENESS OF MUSA PARADISIACA AS AN ANTICOCIDIAL DRUG IN POULTRY

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INTRODUCTION:

Coccidiosis is a parasitic disease caused by protozoan parasites of the genus *Eimeria*. The disease affects all species of both domestic and wild animals and birds, mostly young stock. In poultry coccidiosis is caused by the seven species of *Eimeria* (Marvin *et al.*, 2000) though the most pathogenic and common are *E. acervulina*, *E. maxima* and *E. tenella*. Although coccidiosis has been known for many years, it still remains the most economically important parasitic condition affecting the poultry production industry globally (Gussem *et al.*, 2008). The economic impact of coccidiosis worldwide has been assessed to be over US \$3, 5 billion annually, 70% of which is due to subclinical coccidiosis. For coccidiosis control in poultry, a number of drugs have been developed and approved for use worldwide, (Williams *et al.*, 1999) but reduced sensitivity and resistance are becoming increasingly important as no new anticoccidial compounds are known to be under development (Williams, 2006). Live attenuated and non-attenuated vaccines are available but these are costly. Moreover the fact that live vaccines need host cells to replicate and instigate an active immunity is a disadvantage in that it results in sub-clinical coccidiosis and losses through diminution of performance especially in the absence of growth promoters (Vezey, 2006). Attenuated vaccines have also been associated with high incidence of bacterial enteritis (Michael, 2010).

The current technologies of curtailing drug resistance or reduced sensitivity involve such methods as rotating different types of drugs (McLoughlin, 1999). In sub-Saharan Africa such methods tend to be difficult to employ because of erratic drug availability. For instance in Zimbabwe the only commonly available anticoccidial on the market is Sulphachloropyrazine sodium monohydrate (ESb₃) and no other options to rotate with. Moreso switching from one drug to another is generally viewed as costly by most farmers who in most cases are resource constrained (Cox, 2006). Vaccines have proved expensive even in the developed world and their popularity in sub-saharan Africa is quite low. To this end coccidiosis has tended to ravage resource poor farmers unabated. There is need to develop effective and cheaper alternatives to the current interventions of coccidiosis control (Chapman *et al.*, 2002). Novel drug development is one way of dealing with the problem. This can be achieved through scientific evaluation of some of the ethno-veterinary medicines used by the farmers (Schillhorn, 1997) Use of banana plant extracts to cure coccidiosis has been practised for years and claimed to be effective. Matekaire *et al.*, (2005) reported positive effects of banana root extracts as coccidiostat. Nonetheless they were working with rabbits which are parasitized by different species of *Eimeria* from poultry. Currently scientific evidence supporting the efficacy of such medicines in poultry is scarce. As such these medicines cannot safely be recommended for use. There is therefore need to evaluate the effectiveness of *Musa paradisiaca* plant extracts as an anticoccidial drug in poultry using scientific protocols.

MATERIALS AND METHODS:

EXPERIMENTAL BIRDS:

Female day old broiler chicks (Ross 308) were procured from local breeders. "On arrival they were wing banded" for identification, weighed and randomly allocated to the treatments. The birds were housed in cages with grass litter as

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bedding. Ambient temperature at placement was 32°C and was gradually decrease to 21°C by the end of the trial. Continuous lighting was provided in the cages throughout the trial. All birds were given a commercially formulated basal diet devoid of any growth promoters or coccidiostats. Clean fresh water was availed ad-libitum as well as electrolytes as and when necessary.

PREPARATION OF THE BANANA ROOTS:

Banana roots were extracted from local growing banana plants (*Musa paradisiaca*), thoroughly cleaned of all the dirty under a running tap. The roots were split open in half and then sun-dried for 21 days. When completely dried the roots were then ground in a hammer mill with a 5mm sieve.

TREATMENTS:

There were two treatments and a control. One treatment group was infected and treated using a conventional anticoccidial [30% Sulphachloropyrazine sodium monohydrate] ESB₃®, the second group was infected and treated using banana roots at 20% inclusion to basal diet. The control group was infected with coccidian and received no treatment. All the groups consisted of 8 replicates of 5 birds each. Each replicate was housed in a separate cage. On day 15 coccidial infections of all treatment groups and the control was done by placing new litter seeded with sporulated oocysts. Individual birds shall pick the Oocysts from the litter at different times and quantities thus mimicking a natural, progressive infection. Sporulated Oocysts of *Eimeria acervulina* (Weybridge strain), *Eimeria maxima* (Weybridge strain) and *Eimeria tenella* (Houghton strain) laboratory strains were used. A fixed amount of each species in a mixture (1.76x10⁴ *E. Acervulina*, 1.25 x10⁴ *E. Maxima* and 7.5 x 10³ *E. Tenella* per bird housed) was mixed in grass litter and spread evenly across the back half of each cage. Treatments commenced 7 days post infection and continued till the 14th day post infection.

DATA COLLECTION:

FAECAL OOCYST COUNTS:

Faecal samples were collected from all treatment groups as from day 7, day 14 and day 21 post infection. A sample of 1g of droppings was taken from each treatment group. A modified McMaster counting chamber technique (Hodgson 1970) was used. A 10% (w/v) excreta suspension in salt solution (151gNaCl /1litre of water) was prepared. After thorough shaking 1ml of the suspension was mixed with 9ml of salt solution (311g of NaCl in 1l of water). The resultant solution was then put into the McMaster chamber using micropipettes. Oocyst numbers were then determined.

LIVWEIGHT GAIN:

Liveweight determinations were conducted on a weekly basis using a standard spring balance. Particular attention was given to weights taken on the day of infection, 7 and 14 days post infection.

STATISTICAL ANALYSIS:

The 2-sample *t*-test statistical model was applied to test significant differences in live mass and faecal oocysts output when using crude banana roots extracts and ESB₃ in Ross broilers suffering from a coccidian attack.

RESULTS AND DISCUSSIONS:

Figure 1 shows that there was a significant decrease in oocyst counts per gram of faecal matter in both banana roots(BR) and ESB₃® treatments ($P \leq 0.05$) between 7, 14 and 21 days post treatment. Banana roots showed a higher efficacy than ESB₃® possibly due to a build up of resistance by the coccidian parasites to the commonly used ESB₃ unlike banana roots. There was also a significant increase in the oocyst output in the control group 7 days after inoculation and then a steady decline though significantly higher than the two treatment groups. The observed decline in oocyst count in absence of any treatment could possibly be stemming from reaction of the bird's natural immunity and apparent decline in reproductive rate of the coccidian parasites.

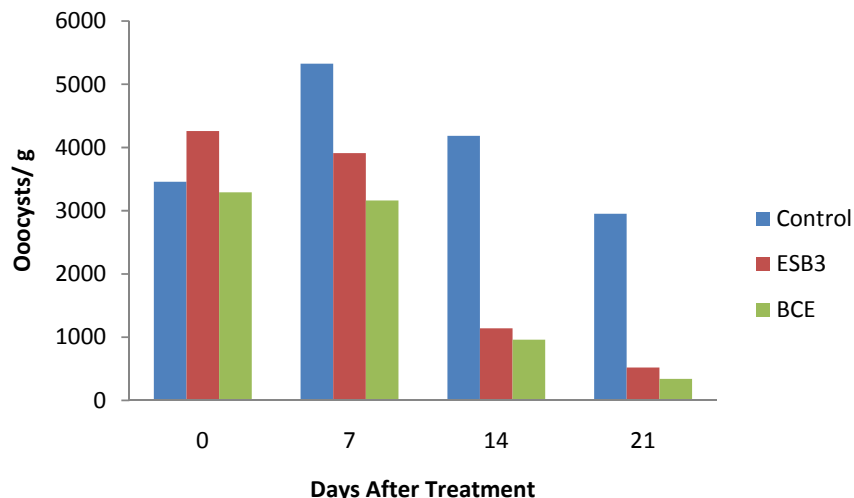


Figure 1: Coccidia count at 0, 7, 14 and 21 days after treatment.

There was an increase in live mass in all the treatment groups from week one to week three with no significant differences between the treatments (Fig 2). The observed trend was probably due to the fact that all the birds were still receiving uniform treatment prior to parasite inoculation and treatments. There was a significant difference ($P < 0.05$) in live mass between the control group and the ESB₃ treatment group whilst on the other hand there was no significant difference between the control and banana roots group. Figure 2 shows that there were significant differences between the control and the two other treatments ($P < 0.05$) and there are no significant differences between ESB₃ and banana roots treatments in weeks 4 up to week 7. Depressed Liveweight gains observed in the control was due to the growing load of coccidian parasites and their negative effects on feed intake, digestion, absorption and utilisation. The absence of significant difference between ESB₃ and banana roots treatment groups indicates that the efficacy of Banana roots is quite comparable to that of the recommended conventional chemical ESB₃.

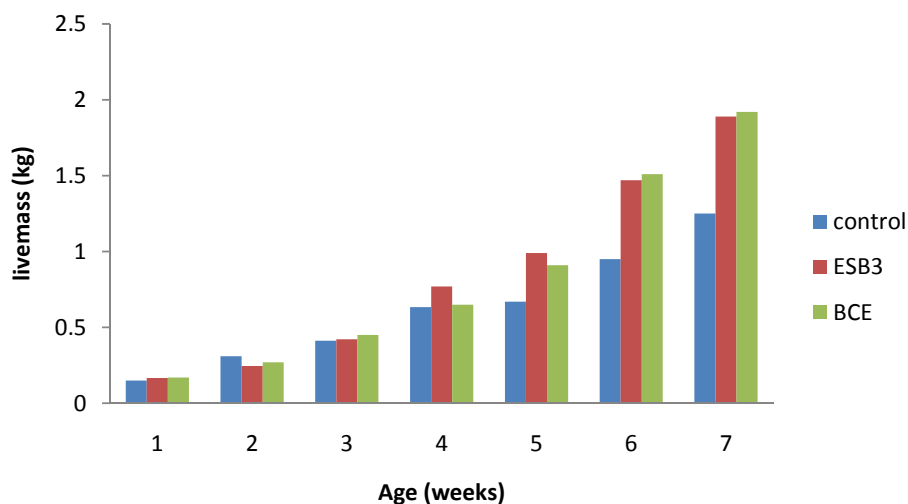


Figure 2: Liveweight gain over a 7 week period

CONCLUSIONS AND RECOMMENDATIONS:

This study showed that Banana root are effective in controlling coccidiosis in broilers under intensive management system. It further demonstrates that the banana root extract is numerically superior to the conventional drug ESB₃. The use of banana roots is cheaper and sustainable given the abundance of the banana trees in sub-saharan Africa. Nevertheless a further study into this promising drug is needed as the levels of inclusion hereby used were derived from an earlier study by Mupangwa *et al.* (2005), so there is need to determine the safest yet effective inclusion level in dry feed before full recommendation for use at a wider scale. Moreso the active ingredient needs be identified and the safety of the same to human consumers of the resultant product.

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