International Journal of Innovative Research in Medical Science (IJIRMS)
Volume 02 Issue 07 July 2017, ISSN No. - 2455-8737
Available online at - www.ijirms.in

Open Access Journal | Research Article | DOI: 10.23958/ijirms/vol02-i07/16

Evaluation of Effectiveness of Boswellia Dalzielii Ethanol Bark Extract in the Control of Poultry Coccidiosis Experimentally Induced in Vom- Nigeria

Dogo G. I. A.[*1], Sa'ayinzat, F. E.[2], Ikpa, L. T.[3], Tanko, J. T.[3], Fantur, D.[4], Blnjing, R. N.[4], Anani, H. M.[4]

[*1]Department of Parasitology and Entomology, Faculty of Veterinary Medicine, University of Jos, Jos Nigeria
[2]Department of Theriogenology and Production, Faculty of Veterinary Medicine, University of Jos, Jos Nigeria
[3]Parasitology Division, National Veterinary Research Institute, Vom, Nigeria
[4]Federal College of Animal Health and Production Technology, Vom Nigeria

Corresponding Author: Tel.; +234 (0) 8034501914 E-mail: gonidogo @ gmail.com

Abstract:

In this study, the effectiveness of Boswellia dalzielli ethanol bark extract was evaluated experimentallywith Sulphachlopyrazine (ESB3™) in the treatment of cecal coccidiosis in broiler chickens in Vom. A total of 28 birds were randomly divided into 4 groups of 7 birds each after being acclimatized in cages. Group A were infected and treated with Boswellia dalzielli ethanol bark extract; Group B, infected and treated with (ESB3™); Group C, infected and not treated (Positive control). All groups were infected with 20,000 sporulated Eimeria tenella oocysts orally each, while Group D was not infected and no treatment as negative control. Results obtained from Groups A and B as 11,300 epg / 1,175 epg and 8,300 epg/3,398 epg oocysts count before and after treatment respectively. Group C were infected and not treated had 9,800 epg as counts. Boswellia dalzielli bark extract incidentally has shown to be more effective compared to sulphachlopyrazine (ESB3™) (Standard Drug) based on oocyst output and in the treatment of poultry coccidiosis induced by Eimeria tenella experimentally.

Keywords: ***Boswellia dalzielii, coccidiosis, Sulphachlopyrazine Eimeria tenella, experimentally.***

Introduction

In Nigeria as well as in most developing countries, Animal diseases remain one of the principal causes of poor livestock performance, leading to an ever-increasing gap between the supply and demand for livestock products. Among such diseases is poultry coccidiosis caused by intestinal single-celled microscopic protozoal parasites of the *Eimeria spp* belonging to the phylum Apicomplexa. Poultry coccidiosis is common in both intensively managed birds as well as those on free range resulting to high economic losses (Sa'ayinzat *et al*. 2014). Nine *Eimeria spp* have been incriminated in poultry coccidiosis and include *E. brunetti, E. maxima, E. necatrix, E. tenella, E. acervulina, E. mitis, E. mivati, E. praecox* and *E. hagani.* Amongst the nine *Eimeria spp* involved in poultry coccidiosis, Muazu *et al.,* (2010) found four *Eimeria spp*. namely *E. tenella, E. maxima, E. necatrix* and *E. acervulina* to be important in causing poultry coccidiosis in Vom, Plateau State. The different *Eimeria spp*. has predilection sites where pathological lesions are produced within the different parts of chicken gut. As a result coccidiosis in poultry has been described as caecal or intestinal coccidiosis depending on the *Eimeria spp*. and site where lesions are found (Calnek *et al.,* 1997). The common clinical signs of coccidiosis in pullets and layers include ruffled feathers, droopiness and listlessness, bloody and diarrhoeal faeces, weight loss, high mortality and low egg production (Conway and McKenzie, 2007). Various factors are associated with the presence of coccidiosis in chicken amongst which are litter management and biosafety, the season of the year, particularly ambient temperature and humidity have great influence on the occurrence of coccidiosis (Saayinzat *et al*., 2014). Additionally, the tropical temperature and the high humid environment in the rainy season aggravate the chances of having coccidiosis in poultry (Saayinzat *et al*., 2014). Blake and Tomley (2014) have estimated the losses incurred by poultry farmers worldwide to reach $3 billion per annum. The poultry industry being one of the most capitalised subsectors of the Nigerian agricultural sectors, suffers enormous losses, which is yet to be estimated in monetary terms. As a major source of animal protein in form of meat and eggs, manure, income and employment, poultry remains an important part of the economic resilience of the Nigerian Nation as well as an instrument for socio-cultural development among inhabitants. With the proliferation of small-scale poultry farms especially in semi-urban and rural population in Nigeria, coccidiosis has become one of the

DOI: 10.23958/ijirms/vol02-i07/16

most economically significant parasitic diseases of poultry (Jatau *et al.*, 2012; Olarewanju and Agbor, 2014). It is a major cause of poor performance with consequent reduction in productivity. It is a major cause of high morbidity and mortality in poultry farms with mortality reaching 50% in some commercial farms (Musa *et al.*, 2010). Although, the prevalence of 12% in epidemiological studies has been reported by Adene and Oluleye (2004); Muazu *et al.* (2010) had a prevalence of 36.7% in adult birds and 52.9% in younger birds. Thus, poultry farmers have continued their efforts into searching for alternative, more effective ways of preventing and managing coccidiosis in their farms apart from using coccidiostats. Amongst such newer majors to combact poultry coccidiosis is the use of herbal treatment. In recent times, herbal medicines have become indispensable and are forming an integral part of the primary health care system of many nations. Boswellia dalzielii (family Burseraceae), commonly known as frankincense tree; abounds in the Savannah regions of West Africa. The plant has several medicinal uses. The decoction of the stem bark is used to treat rheumatism, septic sores, venereal diseases and gastrointestinal ailments (Burkill 1985; Evans, 1989), Phytochemical studies of the plant revealed the absence of alkaloids (Baoua et al; 1976), while saponins, tannins, flaonoids, cardiac glycosides, steroids, and terpenes were found to be present (Alemika and Oluwole, 1991; Adelakun et al., 2001). The methanolic and aqueous extracts showed antibacterial and antifungal activities. (Ntiejumokwu and Alemika, 1991; AdeJakun *et al.*, 2001). Recent studies of the aqueous extract of the stem bark of Boswellia dalzielii showed no antimicrobial activity against all the microbes, used, however, produced some anti-ulcer activity (Nwinyi *et. al.*, 2004). In another recent study, incensole was found to be part of the chemical composition of the stem-bark of *Boswellia dalzielii*. The use of various parts of the plant *B. dalzielii* as herbal preparations in the treatment of both human and animal diseases, especially in Nigeria has been documented (Nwinyi *et al*., 2004; Aliyu *et al.*, 2007). So also, the toxicity studies of the leaf extract of the plant extract against immature stages of mosquitoes has been studied and documented (Younoussa *et al*., 2016). Studies' evaluating the use of *B. dalzielli* in poultry coccidiosis has not been documented. Yet this is paramount in the current coccidiosis scourge beleaguering poultry farmers in Nigeria and other countries. Poultry coccidiosis has become resistant to most conventional treatments and preventive methods and therefore the need to explore alternative treatment and preventive techniques. The current study is aimed at evaluating the effectiveness of *Boswellia dalzielii* ethanol extract on experimentally induced poultry coccidiosis and its possible used as an alternative treatment method under field condition.

Materials and Methods

Plant Sample and preparation of crude extract

The bark of the tree *Boswellia dalzielii* was used for this study. The herbal material was obtained from Boggom village in Kanam LGA of Plateau State. The plant was identified by an agropastoralist at the Federal College of Animal Health and Production Technology, Vom. The pealed bark was processed using a modification of the method described by Nwinyi *et al.*, (2004). The bark of the herbal plant was air dried and pounded into powder. The crude extract was prepared by boiling 10 grams of the grounded bark into an equal mix of 100 cubic centimetres of water and ethanol. The Bark extract was analysed for the presence of boswellic acid, resins, flavonoids, glycoside, saponins and tannins by phytochemical analysis.

Experimental Birds:

Twenty-eight day old broiler chicks used for this study were obtained from ECWA Rural Development Hatchery, based in Bukuru, Jos South LGA, Plateau State. They were fed with water and broiler starter (vital feed) *ad libitum* for five weeks. The birds were free from coccidian oocysts before infecting them following faecal examination by simple floatation technique.

Treatment of Birds

Group A birds were infected with 20000 sporulated *oocyst* of *Eimeria tenella* orally and treated 5 days post infection daily with 1 mL of the extract of *Boswellia dalzielii*. Similarly, group B birds were infected with 20000 sporulated *oocyst* of *Eimeria tenella* orally and treated 5 days post infection with the standard drug Sulphachlopyrazine (ESB3™). Group C were infected with 20000 sporulated *oocyst* of *Eimeria tenella*, 5 days post infection, and signs of coccidiosis were observed seriously and were not treated as negative control. Group D, were observed as not infected and no treatment control group.

Feacal analysis

The modified McMaster method was employed to examine and count the oocyst output using the egg per gram faeces daily for five days in each group described by Dogo *et al.*, (2007).

Results

The results recorded in 28 broilers over a five week period showed the following outcomes. The *Eimeria tenella* oocyst count before treatment in group A was 11,300 eggs per gram faeces five days post infection and 1,175 egg per gram post treatment. In group B, oocyst count reduced from 8,300 eggs per gram faeces before treatment to 3,398 eggs per gram faeces after treatment with the standard drug ESB3™ treatment as shown in Table 1. No mortality was seen in group A and group B, while group C had 4 mortalities thirteen days post infection as a result of heavy infection.

DOI: 10.23958/ijirms/vol02-i07/16

TABLE 1: Oocyst count pre and post treatment with *Bosweilla dalzielii* and Standard Drug Sulphachlopyrazine (ESB3™) infection with 20000 sporulated oocyst of *Eimeria tenella* orally.

Experimental Group	Number of Birds	Mean Oocyst count pre-treatment	Mean Oocyst count post-treatment	Mortality
A	7	11,300 epg	1,175 epg	-
B	7	8,300 epg	3,398 epg	-
C	7	-	9,800 epg	4
D	7	-	-	

P<0.00001

Key:

Group A: Infected and treated with *Bosweilla dalzielii*
Group B: Infected and treated with Standard Drug Sulphachlopyrazine (ESB3™)
Group C: Infected and not treated (Positive Control)
Group D: Not infected not treated (Negative Control)

Discussion:

Coccidiosis is a parasitic disease that can cause severe losses in poultry meat and egg production. The parasites multiply in the intestines, causing tissue damage, lowered feed intake, poor absorption of nutrients from the feed, poor weight gain, dehydration and blood loss. Birds are more likely to get sick from secondary bacterial infection. An outbreak of *coccidiosis* not treated and unattended to may eventually run its course, and birds surviving from the outbreak may acquire immunity, even though they may not regain full production (Dogo *et al*., 2007). Coccidia are very prolific parasites. A single sporulated oocyst can have a big impact when eaten by a chicken. Each oocyst has four sporocyts in it, and each sporocyt has two sporozoites in it. The digestive tract releases eight sporozoites from oocyst, and then move into the cell lining of the digestive tract. Inside the cell, the parasite divide and invade more cells. There may be several generation of asexual multiplication, however this is self-limiting and eventually stops. Finally, a sexual stage occurs in which male and female organisms unite and form new oocyst that are protected by a thick wall and is what is referred to as oocysts, which are shed in the feaces. In the above study, the extract of the herbal plant *Boswellia dalzielli* demonstrated some efficacy by reducing the parasites burden after eight days of treatment. Results of some studies showed that the crude extract of the stem bark of *Boswellia dalzielii* has activity against some gram-positive and gram-negative bacteria (broad spectrum of activity) (Ntiejumokwu and Alemika, 1991. The study also demonstrated that the extract of *B. dalzielli* was more effective in the reduction of the *E. tenella* oocysts in poultry than ESB3™ which was the standard drugs. Therefore, the extract of *Boswellia dalzielli* has shown to be more potent as compared with ESB3 in the treatment of coccidiosis caused by *eimeria tenella* in broilers experimentally. The reason why *Boswellia dalzielli* could be more effective in the control of coccidiosis as compared to ESB3 may not be farfetched probably due to chemical components like flavonoids and the tannins (Etuk *et al.,* 2006; Abdulazeez *et al*., 2013). *B. dalzielli* bark extract enhances intestinal movement through the action of one of its active ingredients, antraquinones, thereby allowing quick discharge of faecal coccidian oocyst (Nwinyi *et al.,* 2004; Etuk *et al*., 2006). Also, the presence of *boswellic* acid could be responsible for the destruction of the developmental stages of coccidian parasites, thereby eliminating the condition. ESB3 being a sulphonamide, acts against *Eimeria accervulina* and *Eimeria maxima* (Fanatico, 2006), by inhibiting intercellular coccidian developmental stages. Therefore, in this study, *B. dalzielli* has shown to be more effective against *E. tenella* as compared to ESB3. The remaining three birds in group C were able to resist the pathogenic effect of *E. tenella* and thus were able to develop immunity against further infection. This is in agreement with the report by Dogo *et al*. (2007) that immunity can be acquired in *E. tenella* infection in broiler chickens, as was seen in the three birds that survived. Where, infected birds shed the coccidian oocyst through faeces, thus contaminating feed and water, other birds may contract the diseases and may die, while some could resist the infection and thus become protected. This study demonstrates that *B. dalzielli* bark extract has the potential to serve as a potent coccidiostat against poultry coccidiosis especially were *E. tenella* is incriminated. Furthermore studies are required to determine the most effective dosage, the most active ingredient responsible for curbing coccidian infection in poultry and its mode of action; toxicological studies to determine the lethal dose and toxicity of the bark extract.

Acknowledgement

The authors acknowledge the roles and support of Livestock Investigation Department and Parasitology Division of the National Veterinary Research Institute Vom for assisting with regular care of birds and technical support during the course of the experiment.

References

DOI: 10.23958/ijirms/vol02-i07/16

[1] Abdulazeez AT2, Kabele-Toge B3, Lawal M1 and Abubakar MG1 (2013). Phytochemical, Antibacterial and Toxicological Studies of Aqueous Stem Bark Extract of *Boswellia dalzielli*. *African Journal of Pharmaceutical Research and Development*, 5(1): 61 – 67.

[2] Aliyu, R., Gatsing, d. and Jaryum, K. H. (2007). The effects of *Boswellia dalzielli* (Burseraceae) aqueous bark extract on rat liver function. *Asian Journal of Biotechnology*, 2(5): 359 – 363.

[3] Dogo, G. I., Ogunsan, E. A., Velkers, F. C., Halasa, T., Kamani, J. and Heesterbeek, J. A. P. (2007). Efficacy of *Momordica balsamina* fruit Extract against *Eimeria tenella* in Boriler Chicken. *Animal Production Research Advances*, 3 (4): 277 – 281.

[4] Etuk, E. B., Okoli, I. C., and Uko, M. U., (2004). Prevalence and management issues associated with poultry coccidiosis in Abak Agricultural Zone of Akwa Ibom State, Nigeria. *International Journal of Poultry Science*, 3(2): 135-139.

[5] Etuk, E. U., Agaie, B. M., Onyeyili, P. A. and Ottah, C. U. (2006). Anti-diarrhoea effect of *Boswellia dalzielli* stem bark extract in Albino rats. *Journal of Pharmacology and Toxicology*, 1(6): 591 – 596.

[6] Fanatico, A. (2006). Parasitology Management for Natural and organic Poultry: Coccidiosis. NCAT Agriculture Specialist.

[7] Nwinyi, F. C., Binda, L., Ajoku, G. A., Aniagu, S. O., Enwerem, N. M., Orisadipe, A., Kubmarawa, D. and GAMANIEL, K.S. (2004). Evaluation of the aqueous extract of Boswellia dalzielii stem bark for antimicrobial activities and gastrointestinal effects. *African Journal of Biotechnology*, 3 (5): 284 - 288.

[8] Sa'Ayinzat F. E., Shaibu S. J., Dogo G. I. A. and Ayinzat, D. F. (2014). Preliminary observation on the efficacy of Livacox Vaccine against coccidiosis in laying birds in a backyard poultry farm in Jos, Plateau State, Nigeria. *African Journal of Natural Sciences*, 17: 71 - 79.

[9] UNESCO (1996). Culture and Health, Orientation Texts- World decade for cultural development 1988-1997. Document CLT/DEC/PRO-1996, Paris, France. 125.

[10] Younoussa, L., Nukenine, E. N. and Esimone, C. O. (2016). Toxicity of *Boswellia dalzielii* (Burseraceae) Leaf Fractions Against Immature Stages of *Anopheles gambiae* (Giles) and *Culex quinquefasciatus* (Say) (Diptera: Culicidae). *International Journal of Insect Science*, 8: 23 - 31.

DOI: 10.23958/ijirms/vol02-i07/16