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Comparison of Aloe Vera And Sulphadimidine In the Control of Coccidiosis in Broiler Chickens

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ABSTRACT

Coccidiosis is the costliest and wide-spread parasitic disease in the poultry industry, and has been mainly controlled by the use of different chemotherapeutic agents. Due to the emergence of drug-resistant strains, alternative control strategies are needed. Therefore, an experimental type of study was conducted to compare Aloe Vera and sulphadimidine in the control of coccidiosis in broiler chickens, a total of 40 unsexed day old Hybrid broiler chicks were randomly selected for this study and the study was conducted within 6 weeks on Fresh Basket farm. Fleshly cut aloe Vera leaves were peeled and squeezed into beaker then measured in measuring cylinder at determined dosages every time before adding to the drinking water of treatment T2 andT3. Among the 40 chicks, 10 chicks were used as a control group while the 30 chicks were used for treatment groups T1, T2 and T3. The 10 chicks used in treatment group (T1) were treated with sulphadimidine 5g/5ltrs of water and the 20 chicks were treated with Aloe Vera extracts and 10 were given a treatment 20mls/5ltrs of water as treatment group (T2) while the other 10 received a treatment of 40mls/5ltrs of water as treatment group (T3). The drugs were administered orally in drinking water. The treatment response of these drugs for coccidiosis with respect to reduction in oocytes count (OPG), Lesion Score and body weight was done by comparing the results from all the treatment groups. The faecal Oocyte count (OPG) was conducted by using a Mc Master counting technique and all data collected was subjected to analysis of variance (ANOVA) at $\alpha = 0.05$ level of significance using Excel 2016. Faecal oocyte shedding decreased significantly ($p < 0.05$) in all of the treatment groups that were treated with Aloe Vera as compared to the treatment group that was treated with sulphadimidine while the control continued to show faecal oocyte shedding. Furthermore, the Aloe Vera supplemented groups showed significantly fewer intestinal lesions ($p < 0.05$) than the control group and the synthetic group following infection. While No significant differences were found in body weight gain or loss between the Aloe Vera treated groups and the groups treated with sulphadimidine and the control group. The findings of this study suggest that Aloe Vera could be used as an alternative treatment for controlling avian coccidiosis.

***Keywords**: Coccidiosis, Oocyte, Lesion, Mc Master, Aloe Vera, Eimeria, Acemannan,*

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INTRODUCTION

The poultry industry has been streamlined over the years to become an agricultural powerhouse in terms of production and technology. In just about 5 weeks, a single chicken house operation could have 50,000 broilers ready for market. As a multi-billion-dollar enterprise ($48.3 billion in 2014), there are many obstacles that will have to be overcome in order to continue to meet the demand of consumers (USDA, 2014).The broiler sector in Zambia has been growing significantly with consumption demand standing at 28 million in 2011 up from 13 million in 2000 (Nicholas Sitco et al 2011). This increase has resulted in many people venturing into poultry broiler production as well as an increase in the number of auxiliary industries such as feed manufacturers, hatcheries and pharmaceuticals. Coccidiosis is common in Zambia, as in many other countries of the world (Blomqvist et al., 2010). Coccidia are protozoa and the most common species is Eimeria. Coccidia are completely species specific. The disease has a direct oral-fecal pathway. The infection is spread also indirectly, for example through people and equipment. The prepatent period is 4-7 days, but it varies between coccidian species.

The severity of the symptoms depend on infectious dose, immune status, type of coccidian, and possible secondary infections, but ranges from mild diarrhoea, blood in the feces, poor general conditions to sudden death (Blomqvist et al., 2010). Even subclinical infections occur and are characterized by high morbidity and low mortality. Although animals of all ages are susceptible to Eimeria infection, coccidiosis is usually more prevalent in animals that are stressed or malnourished. The prevalence of coccidiosis is particularly high in young ages (Fanatico, A., 2006). and the impact of the disease is severe and may be fatal. The severity of clinical signs is dictated by the species of Eimeria involved, infection pressure, the host's immune response, and the presence of secondary or concurrent infections and environmental conditions. Coccidian infection of the intestinal mucosal cells is associated with massive destruction of enterocytes and increased crypt proliferation. In clinically infected animals, the disease is characterized by the presence of moderate to severe diarrhoea which is bloody and may also contain shreds of mucous in severe infections. Birds with subclinical infection do not show clinical signs, but can shed the oocytes within the feces.

When coccidiosis reaches a clinical phase, broilers will display a typical "sick bird" attitude with depression, prostration with huddling under the source of heat as if they feel cold, and producing watery or bloody droppings (Cervantes, 2006). However, there are only few options for the diagnostic of subclinical coccidiosis. Oocytes per gram of feces (OPG) can be counted by using a practical technique (McMaster) and is a method that can be useful and applicable at farm level and only demands simple equipment and a trained person. The method can be used for detecting and measuring infection dynamics of individual broilers (Roepstorff and Nansen, 1997) or a group of individuals by pooled samples or by litter analysis (Long and Rowell, 1975). However, OPG data alone gives little indication of severity of infections and, in addition, morphological examination for speciation is very difficult (Thebo et al., 1998). Analysis of OPG in farmed chickens may identify the epidemiology of the disease and thus the population dynamics. However, methods should be used in combination if determination of the role of the subclinical disease on productivity is the target.

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All sorts of coccidian infections damage the intestine. Diagnosis is made by post mortem examination and direct smear from the damaged intestine. The coccidian species can be determined by PCR. At autopsy different types of intestinal damage, depending on which coccidian species it is; including for example lesions in the jejunum, thickened/dilated intestinal wall, mucus and blood in the intestines, petechial bleeding, white spots and necrotizing/mucohaemorrhagic enteritis can be found.

Coccidiosis causes considerable economic loss in the poultry industry, especially in broiler chicken as it is associated with reduced growth rate and impaired feed conversion thus leading to poor performance of chicken and mortality (Usman et al., 2011).Coccidiosis is the direct result of contamination into the intestinal walls by minute parasitic organisms called coccidian (Gordon: 2005). During their life cycle the different developmental stages of the coccidia will invade vast numbers of intestinal cells and destroy them as they feed (Suls, 1999). Stages of coccidia in chickens appear both within the host as well as outside. The developmental stages in the chicken give rise to a microscopic egg (called an oocyst) that is passed out in the droppings. Under proper conditions of temperature and moisture, the oocyte develops within one to two days to form sporulated oocytes, which is capable of infecting other chickens. At this stage, the oocyte contains eight bodies (called sporozoites), each of which is capable of entering a cell in the chicken's intestine after the oocyte is eaten. When sporozoites enter the cells, they divide many times producing either a few or many offspring (merozoites). The numbers produced depend on the species of coccidia involved. Each merozoite, in turn, may enter another intestinal cell. This cycle may be repeated several times. Because of this cyclic multiplication, large numbers of intestinal cells are destroyed. Eventually, the cycle stops and sex cells (male and female) are produced. The male fertilizes the female to produce an oocyte, which ruptures from the intestinal cell and passes in the droppings. Thousands of oocytes may be passed in the droppings of an infected chicken; therefore, poultry raised in crowded or unsanitary conditions are at great risk of becoming infected.

Avian coccidiosis is caused by several species of Eimeria (family Eimeriidae) that belong to the phylum Apicomplexa. This phylum comprises many members of entirely parasitic diseases of humans and animals with a wide environmental distribution. Organisms belonging to this phylum are obligate intracellular parasites characterized by unique specialized organelles, most notably those from within the apical complex (micronemes, rhoptries, dense granules, and conoid and polar rings), that would provide the structural stability required during the host invasion process (D. A. Morrison, 2009).

Each species of parasite has a predilection for a specific site in the gastrointestinal tract. For instance, E. acervulina develops in the duodenum, E. maxima and E. mitis develop in the middle part of the small intestine, E. tenella develops in the caeca, E. brunetti develops in the caeca and the rectum, and E. necatrix develops in the small intestine (M. Raman et al, 2011).The species of Eimeria that are reported as highly pathogenic are E. brunetti, E. maxima, E. necatrix, and E. tenella. Species reported as mildly pathogenic include E. acervulina, E. mitis, and E. mivati, whereas E. praecox and E. hagani are considered to be the least pathogenic (A. Nematollahi et al, 2009).

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Coccidiosis continues to burden the poultry industry worldwide (Price, K.R, 2012.). This disease is one of the most frequently reported diseases worldwide and is present wherever poultry are raised (Zhang et al 2013). The annual cost of coccidiosis globally is estimated to be approximately $2.4 billion (Zhang et al 2013). However, each country and local city has different costs associated with coccidiosis. The cost of coccidiosis and impact on poultry production is due to the cost of coccidial control (e.g. medication and vaccination), predisposition to secondary disease, sickness (e.g. decreased performance due to impaired growth rate, poor feed conversion or temporary reduction in egg production) and mortality (Price, et al 2013).Coccidiosis is one of the most important parasitic diseases and the much feared .This is especially common among young birds. The symptoms of the disease are thin blood-streaked feces and weight loss by the chickens. Coccidiosis is caused by protozoan parasite of the genus eimeria and can cause poor growth and sometimes death (Mathis et al. . , 1989) Coccidiosis is responsible for 6-10% of all broilers mortalities (weber, 1997) and estimated annual costs of anti-coccidian drugs worldwide is 800 million Dollars.

Currently, control largely rely on chemotherapy and immuno-prophylaxis which has led to development of drug resistance strains and affects withdraw period prior to slaughter. However, the development of drug resistance strains in the field and the withdrawal period for these drugs prior to slaughter necessitate the exploration of alternative methods of treatment such as the use of medicinal plant extracts for controlling the disease (Usman et al, 2011).However farmers are constrained from controlling the disease by the inhibitory high costs of drugs and the fragmented veterinary service provision (Kusina et al, 2001). The use of aloe is believed to be cheaper and reliable though there is no documented evidence to substantiate such a claim.

Aloe Vera is a cactus-like plant. It is stem less with triangular, fleshy leaves ranging in colour from grey-green to bright green and the margins of the leaves have small white „teeth". The leaves are composed of three layers: an inner gel, a yellow sap and the outer thick layer of 15-20 cells known as rind (Surjushe et al., 2008; Hashemabadit and Kaviani, 2010). Aloe Vera medicinal plant could be an effective substitute for coccidiostates because of its chemical nature and antimicrobial activities. Aloe Vera contains over 75 compounds (vitamins and minerals), acemannan an active ingredient and pH 4.55 (Chinnah et al., 1992 ;). Aloe Vera (Aloe barbadensis Miller) has been used as a medicinal plant for centuries, and it has been relatively well researched. Recent studies have considerably expanded our knowledge about the medicinal properties and applications of aloe vera. The succulent plants of the genus Aloe belong to the lily family (Liliaceae) (Choi and Chung, 2003). Aloe Vera is cultivated for its fleshy leaves that contain mainly latex and gel. Aloe Vera gel contains 98.5 to 99.5% water and 75 biologically active compounds (Darabighane and Nahashon, 2014). Polysaccharides account for around 60% of the solid fraction of aloe Vera gel. The most important polysaccharide is acemannan, which is one of the most potent immunomodulators of plant origin (Darabighane et al., 2012). Aloe Vera contains anthraquinones, saccharides, vitamins, enzymes, minerals, and hormones that are responsible for its anti-inflammatory, antibacterial, antifungal, and anti-carcinogenic properties (Surjushe et al., 2008). Aloe Vera inhibits the attachment and entry of the

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influenza virus, cytomegalovirus, human herpes virus, and polio virus into host cells (Sydiskis R.J et al., 1991). The major ingredients of Aloe Vera include anthraquinones, saccharides, vitamins, enzymes, and low-molecular-weight compounds (Choi and Chung, 2003) which give Aloe Vera its anti-inflammatory, immunomodulatory, wound-healing, anti-viral, anti-fungal, anti-tumour, anti-diabetic, and anti-oxidant effects (Christaki and Florou-Paneri, 2010). Numerous studies suggest that many benefits of Aloe Vera are attributable to polysaccharides contained in Aloe Vera gel, which compose a large part of dry matter in this gel (Hamman, 2008). In other words, almost 60% of dry matter of Aloe vera gel is composed of polysaccharides (McAnalley, 1989). As far as therapeutic efficacy of A. Vera and its component(s) is concerned, it had been reported in different animal models and human beings with promising results (Strickland, 2001; Agarry et al., 2005), although limited work had been conducted on poultry (Djeraba and Quere, 2000; Akhtar et al., 2012).

Objective of the Study

The **main research objective** was to:

Compare the effectiveness of Aloe Vera extract and Sulphadimidine in the control of Coccidiosis.

In order to achieve the general objectives, the study had the following **specific objectives**

1. To assess if aloe Vera extract can reduce oocytes count (opg).

2. To assess the effect of Aloe Vera on the body weight

3. To determine the effect of Aloe Vera on the Lesion score

Hypothesis Testing

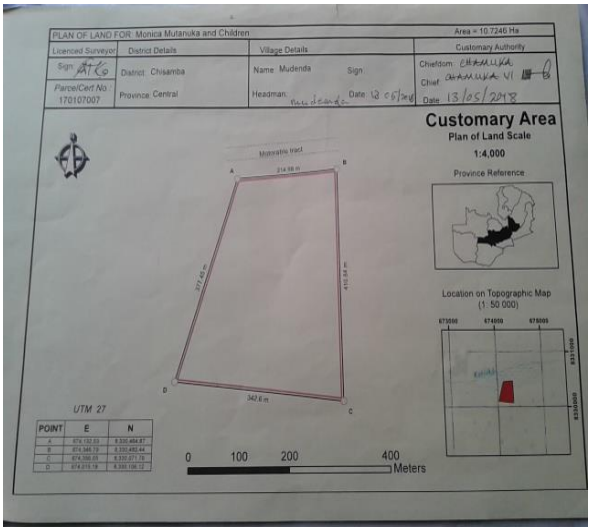
1. HO: There is no significant difference on oocytes counts per gram of broilers receiving the treatments.
2. H1: There is a significant difference on oocytes count per gram of broilers receiving the treatment.
3. HO: There is no significant difference in lesion scores of broilers receiving the treatments.
4. H1: There is a significant difference in lesion scores of broilers receiving the treatments.
5. HO: There is no significant difference on body weight gain of broilers receiving the treatments. H1: There is a significant difference on body weight gain of broilers receiving the treatment.

Materials and Methods

Location of the Study

The study was conducted on fresh basket farm; the farm is located in Kanakantapa of chisamba district in central province. The total farm size is 11 acres. The region is suitable and favourable for both livestock keeping and crop production. The farm practices mixed farming and the animal species kept are cattle, goats and poultry.

Figure 1: Location of the study



Source: Fresh Basket farm

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Sample Size

A total of 40 unsexed day old Hybrid broiler chicks were used. After leaving the hatchery the experimental chicks were grown under uniform brooder conditions from a day old to experimental ages.

Housing and lighting

The broiler house was designed to enable easy cleaning at the end of the rearing period with large windows to allow movement of air to and from inside the house. The windows were covered with wire mesh to avoid wild birds, cats and dogs from entering the house. Wild birds and rodents are attracted by the feed that was given to the chickens. The house is constructed at an elevated and well drained place so that flooding of rain water is prevented moisture due to capillarity does not reach the floors of the house. The house is under the shade of a big tree i.e. for temperature reduction and act as wind breakers that help keep the temperature of the house low especially on hot days and slow the speed of wind. The orientation of the house is east – west. This helps to avoid direct sun rays striking the house. It also helps to block the blowing wind which may help to raise dust in the house. The walls of the house are 60cm – 100cm high from the floor to the windows to prevent crawling insects, snakes and rodents from entering the house. The open windows were covered by chicken wire. The house was well ventilated, to help control temperatures, removal of the moisture and obnoxious gases. The walls were made of bricks, and poles. At the entrance of the house there was a foot bath to disinfect boots upon entry in to the house.

The birds were housed in a disinfected deep litter system with wood shavings as bedding material. The house was disinfected using ultraxide disinfectant 1 week before the arrival of the chicks the goal of disinfection however, was to reduce the number of pathogens bacteria and viruses that can live for several months if protected with organic matter. They live in the soils protected in the crevices of animal houses. The equipment and house were first, rinsed with clean tap water before applying ultraxide disinfectant; disinfectants are not effective in the presence of dirt or manure. Litter is the materials put on the floor in the broiler house; the birds were housed in a deep litter system with wood shavings as bedding material. Litter protects birds from direct contact with the cold floors, absorbs extra moisture from droppings and dilute excreta thus minimizing bird to manure contact. Litter was turned at least twice a week. Turning provides aeration and keeps it dry for the comfort of the birds. To avoid caking wet litter was removed from the house. Each treatment group occupied an area of 2.25 m2 where feed and water were provided. The house was demarcated into 4 different treatment groups using wire gauze. Broilers need continuous supply of light in order to be able to eat throughout. This encourages fast growth because they eat or all the time. During the first 3 days the chicks were given 23hours of light and 1 hour of darkness for the chicks to rest. But starting on day four they had 24 hours of light so that they may eat throughout. The lighting program was provided with a long lighting period (approx.23 hours of light - 1hour dark) in the early stages of brooding to develop the eating and drinking habits of the chicks. Incandescent bulbs were used to provide light and heat day and night during the brooding period.

Brooding

Brooding is defined as the provision of artificial heat from the first- 2-3 weeks of the chick's life

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depending on local weather conditions (F.N.reece. & B.D.lott 1982). Day old chicks are not able to regulate their own body temperature due to undeveloped feather coat. Since the brooding house was too big for the number of chicks, a brooder guard was placed around the heat source so that chicks were confined within the warm place. The brooder guard can be a cardboard paper or an iron sheet. It was 45- 60cm high so as not to allow chicks to jump out and had enough area to comfortably accommodate all chicks. A day before the chicks were collected, the house was warmed up, by switching on the incandescent bulbs so that the chicks come in an already warm room. Preparation of a mixture of sugar solution and a stress pack in the drinkers was done to be given to the chicks. Five (5) table spoons of sugar in 5 litres of water, the solution were distributed well in the house in advance before the chicks were brought in the house. When the sugar solution was finished, a vitamin solution was prepared. Birds are usually stressed upon arrival, so vitamins and electrolyte (e.g. oxytetracycline- vitamins) were given in the first week to make the chicks comfortable as well as stimulating their appetite to eat more. Temperature regulation is not well established in the chicks until they are fully feathered a thermometer was used to monitor brooder temperatures; the temperature in the first week was in the range of 30-32 degrees Celsius. By the end of the second week, the wing feathers started to show making a good covering over the sides of the body of the chicks. The brooder temperature was then reduced to about 29- 30 degrees Celsius, by the end of the 2nd week, the tail feathers had grown. The brooder temperature was then reduced to about 28 degrees Celsius, By the end of the 3rd week, other feathers on the body of the chicks had grown and those around the bottom of the neck. Only the head had yellow feathers the room temperature was again reduced to 27 degrees Celsius. By the end of the 4th week, the birds were fully feathered. At this time the chicks have better control of their body temperature and heaters were no longer needed.

Feeding and Water supply

The 2-phase feeding program which comprises of a starter feed from day old to 4weeks old and then a finisher fed to market weight was used. Farm made feed was given to the birds with the nutrient content as follows: Crude protein 16.51 %, Calcium 4.41 %, Phosphorus0.47 %, Metabolizable energy 3502 cal/g. The birds were fed manually each bird consuming 0.1 kg of feed per day. Feeders were adjusted so that broilers would have a good access to the feed. Starter diets were provided from day 1 day to 16 days of age and finisher diets from day 17 to 35 days of age. The broiler drinks twice as much as it eats e.g. for 1kg of feed eaten it should drink 2 litres of water. Restricted water intakes can cause depressed live weights and production of underweight bird's water was give manually to the birds in the drinkers.

Experimental Design

A complete randomized design was used all the experimental units were assigned randomly among all treatment at start of week 3 (G. Rahimi et al 2005).

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Figure 2: Experimental treatments for the study

Source: Author (2019)

As can be seen on Figure (2) above, Among the 40 chickens, 10 chickens were used as a control group (T0) while the other 30 chickens were assigned to treatment groups (T1, T2 and T3). The 10 chickens used in treatment group (T1) were treated with sulphadimidine 5g/5ltrs of which 1 tea spoon full of powder was added to 5l of water in their drinkers since the label instructs to administer 100 mg per kg bodyweight corresponding to approximately 1 g powder per 1-2 litres of drinking water, and the 20 chickens were treated with Aloe Vera extracts where 10 chickens were given a treatment of 20mls/5ltrs of water as treatment group (T2) while the other 10 chickens received a treatment of 40mls/5ltrs of water as treatment group (T3). The drugs were administered orally in drinking water in there drinkers. All the experimental units were assigned randomly among all treatment at the start of week 3. The chickens were divided into 4 groups containing 10 chickens each. All the groups (T0-T3) were infected at the end of week 2 with litter from confirmed severely infected flock containing oocytes spores and the litter was seeded into treatment groups to create favourable conditions for oocytes development. Contaminated litter was mixed with feed and water to infect the chickens. The feces of the chicken were monitored on a daily basis for the Presence of oocytes. On the 5th day post-infection, oocytes were found in the stool of the birds and treatment commenced (P. Chisoro et al 2017).

Preparation of Aloe Vera

Fleshly cut Aloe Vera leaves were cut and peeled with a knife then squeezed into a beaker and measured in a measuring cylinder at determined dosages every time before adding to 5l of boiled drinking water during treatments for T2 which had a dose of 20mls of Aloe vera per 5l of drinking water and T3 which had a dose of 40mls of Aloe vera per 5l of drinking water then the mixture was thoroughly shacked for 5-7 minutes to ensure thorough mixing and was then kept for 6-8 hours at room temperature before administering to the treatment groups then treatment went on for six days after which the chickens were sacrificed for lesion analyses.

Data collection and Laboratory Experiments

Weight

Growth performance; weekly body weight were taken from all groups up to week 5 all birds from the treatments were weighed on a weekly basis using a digital scale. The unit of measurement was kilogram. Mean weights from each replication were recorded to establish the growth rates against the expected normal growth curve of a broiler.

Fecal Oocyte Count

Estimation of oocytes; After the first seven days during week 4 of treatment 10 g of droppings were taken from each treatment for coccidian analysis at the University of Zambia Veterinary Laboratory in

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Lusaka. Droppings were collected from all groups from day 22 to 29 post challenge for estimation of oocytes per gram (OPG) of feces by Mc master counting technique (Soulsby., 1982). Fecal samples were examined for coccidian oocytes by the modified McMaster technique using saturated sodium chloride solution with 50% glucose monohydrate as flotation fluid. Feces were diluted and well homogenized in tap water depending on sample weight, proportional to 1g of feces in 56-ml of tap water. After 30 minutes standing and re-suspension, the solution was filtrated through gauze (aperture 250 μm) to remove debris. Graded centrifuge tubes were identified and filled to the limit of 10-ml and centrifuged (1200 rpm) for seven minutes. The supernatant was removed and the pellet containing oocytes was stored in the fridge. Next day, tubes were left for 30 minutes at room temperature and the flotation fluid was added to 4-ml. A disposable pipette was used to mix flotation solution with the pellet and quickly transfer the homogenized mixture to the McMaster slide. After five minutes standing to allow oocytes to float, oocytes were counted at 100x amplification using a microscope. Each oocyte visually identified in each of the 12 rows scanned on the McMaster slide corresponded to 20 oocytes per gram of feces (OPG).

Lesion Scoring

Pathology study; all the birds were later sacrificed on day 35 to determine the lesion score (Johnson and Reid., 1970). Based on severity, the lesion scoring process allowed the assessment of whether Aloe Vera was working. The intestines were removed from the birds starting with control group (T0) and the intestinal lesions were assessed based on the lesion score key, assessment was done on the upper, middle, lower, ceca and rectal sections of the intestines. In the current study, the lesion scoring of (Johnson and Reid, 1970) was made as a baseline for assessing the gut lesions from the upper, middle, lower, ceca and rectal sections of the intestines. Thus, the following scoring system was standardized for a scale of 0 to 3 for chickens infected with coccidiosis (DUFFY et al., 2005).A score of "0" was given for intestines without any gross lesions; a score of "1" was given for intestines with scattered lesion, low in number and no changes to gut wall, a score of "2" was also given to intestines that showed more lesion, changes to gut wall and a score of "3" was given to intestines that showed sever lesion, changes to gut wall. The lesion scores were then recorded as the average across the birds (per group) for each segment. Total lesion score was calculated as the sum of lesion scores in the four intestinal segments.

Data Analysis

The data was entered into computer using Excel 2016. It was then analysed using complete randomized design Analysis of Variance (CRD-ANOVA) at $\alpha = 0.05$ level of significance. The results of this study were considered as significant when a P value was less than 0.05. Means were compared for significance of differences by least significance differences (LSD) as suggested by (Steel and Torrie (1981).

RESULTS

Overall Effect of the treatments on Oocytes counts

As can be seen on table (1) below there is a significant difference on oocytes count per gram fecal matter hence the Ho is rejected and gives a significant remark. The highest level of oocytes was recorded in the Control and AV20mls then

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AV40mls and lastly SULPD had the least oocytes count.

Table 1: Overall Effect of the treatments on Oocytes counts

Age (weeks)	CONTROL	SULPD	AV20mls	Av40mls
3	5150.00[a]	3787.50[d]	4706.25[b]	4054.25[c]

Source: Author (2019)

Below is a complete randomized design Analysis of Variance (CRBD-ANOVA) test which resolves the question to whether there is no significant difference on oocytes counts per gram of broilers receiving the treatments. The H0 stated that there is no significant difference on oocytes counts per gram of broilers receiving the treatments while the H1 stated that there is a significant difference on oocytes count per gram of broilers receiving the treatment.

Table 2: Shows the Anova analysis for oocytes count (opg)

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Rows	3.17E+08	7	45325893	3.125983	0.000253	1.852811
Columns	7776875	3	2592292	11.394531	0.008237	3.072467
Error	1.38E+08	21	6570565			
Total	4.63E+08	31				

Source: Author (2019)

Table 2 above shows the results generated form Excel (2016) on ANOVA. After conducting the CRD-ANOVA test, the results showed that there is enough proof to reject the Ho since F = 3.125983 is greater than Fcritical = 1.852811 and F = 11.394531 is greater than Fcritical = 3.072467. It can also be noticed that, the P-value = 0.000253 is less than the significant level $\alpha = 0.05$ and the P-value = 0.008237 is less than the significant level $\alpha = 0.05$. This concludes that the results above prove that there is a significant difference on oocytes count per gram of broilers receiving the treatment.

Table 3: Oocyte count per gram from day 22-29

Days	DAY22	DAY23	DAY24	DAY25	DAY26	DAY27	DAY 28	DAY29
CONTROL	6200	5500	6000	4250	4200	5500	3000	3000
SULPD	6000	5500	7900	6000	3000	1800	50	50
AV20mls	1800	7900	4200	5500	4200	700	400	300
AV40mls	12600	6200	7900	6000	2000	600	200	150

Source: Author (2019)

In an in vitro experiment to compare the effects of Aloe vera and Aloe spicata on inhibition of the sporulation of avian coccidia oocytes, Mwale et al. (2006) reported that increase in Aloe vera and Aloe spicata content significantly decreases coccidian oocyte count. Darabighane and Zarei (2011) also reported that broilers receiving 2.5% Aloe vera gel added to their feed had the smallest fecal oocyte shedding among all groups. Recently, researchers all over the world have tested plants for their anticoccidial activities and have found Aloe vera to be effective in the control and prevention. (Elbanna et al. 2012) observed a significant decrease in fecal oocytes count in broiler chickens that were infected with mixed sporulated Eimeria oocytes and treated with aqueous extract of Allium sativum and Aloe vera alone or in combination. Similar result were obtained by (El-Khtam et al. 2014) when they observed a reduction in total oocytes count in Aloe vera supplemented group compared with turmeric supplemented group at different concentrations of 5

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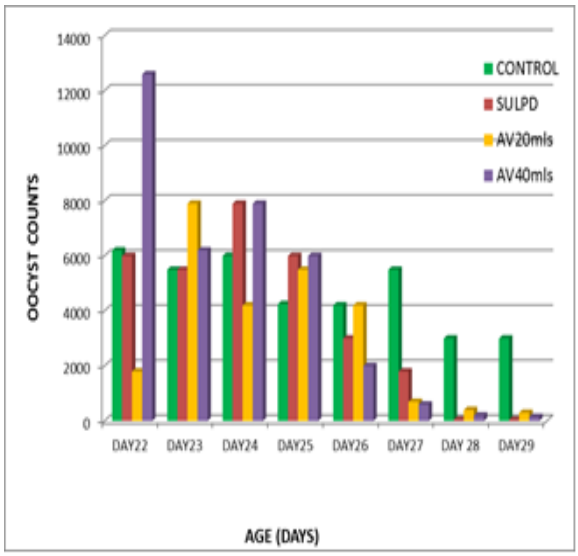
g/l and 10g/l each in broilers infected with 10,000 sporulated oocytes of mixed Eimeria species in broiler chickens. Furthermore, (Dkhil et al. 2011) reported a significant reduction of oocytes output in Aloe vera treated Broilers infected with E. papillata. It can therefore be concluded that Aloe vera posse's anticoccidial activity which was comparable with that of anticoccidial drugs sulphadimidine.

Chart 1: Illustrates the Graphical representation of oocytes counts from day 22 to day 29



Source: Author (2019)

It was observed as shown in chart (1) above that there was a steady reduction in the oocytes count as at day 22 up to day 29, the results shows that the highest level of oocytes was recorded in the Control and AV20mls then AV40mls and lastly SULPD had the least oocytes count. This proves that the treatment of Aloe vera has a significant effect on oocytes. Yim et al. (2011) reported that broilers that received Aloe vera powder (0.1%, 0.3%, and 0.5%) had smaller fecal oocyte shedding count compared to infected group fed with the standard diet. In addition, Akhtar et al. (2012) found in their studies that fecal oocyte shedding in broilers orally administered with ethanol and aqueous extracts of Aloe vera pulp at 300 mg/kg body weight/day for three consecutive days was significantly lower compared to the infected control group. Akhtar et al. (2012) attributed anticoccidial effects of Aloe vera to production of antibody against coccidiosis, which probably reduces the number of fecal egg and increases weight gain.

Effect of the treatments on body weights of broilers

Several studies have been conducted to examine the effects of Aloe vera on growth performance of broilers. (C. Mehala and M. Moorthy 2008) fed broilers with Aloe vera powder (0.1% and 0.2%) and Curcuma longa powder (0.1% and 0.2%) and a mixture of these two powders, and reported no significant difference in body weight gain and FCR, except for the first week of treatment. In addition, no difference was observed in terms of feed intake. However, Alemi et al. (2012) reported a better growth performance in broilers treated with 0.75% and 1% Aloe vera gel powder compared to the 0.5% Aloe vera gel powder group and the control group. While in this study, the Ho stated that there is no significant difference on body weight gain of broilers receiving the treatments while H1 stated there is a significant difference on body weight gain of broilers receiving the treatment. As shown on table (4) below there is no significant difference on body weight gain of broilers receiving the treatments hence the Ho is correct and this gives a nun significant remark.

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Table 4: illuminates the Effect of the treatments on body weights of broilers

Age (weeks)	CONTROL	SULPD	AV 20ml s	AV40mls
3	915a	820c	857c	892b
4	1304d	1280a	1211b	1031c
5	1928b	1905c	1803a	1927b

Source: Author (2019)

Below is a complete randomized design Analysis of Variance (CRD-ANOVA) test which resolves the statement to whether there is no significant difference on body weight gain of broilers receiving the treatment. The Ho stated that there is no significant difference on body weight gain of broilers receiving the treatments while the H1 stated that there is a significant difference on body weight gain of broilers receiving the treatment.

Table 5: Shows the Anova Analysis for Body weights

ANOVA

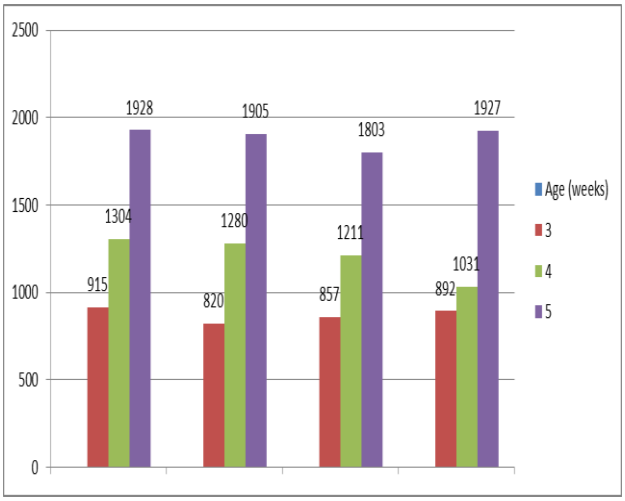
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Rows	0.7125	9	0.079167	1.299132	2.16147	2.920131
Columns	1.83125	3	0.610417	1.438618	2.71805	2.960351
Error	1.325	27	0.049074			
Total	3.86875	39				

Source: Author (2019)

Table 5 above shows the results generated form Excel (2016) on ANOVA. After conducting the CRD-ANOVA test, the results showed that there is enough proof that Ho is true since F = 1.299132 is less than Fcritical = 2.920131 and F 1.438618 is less than Fcritical = 2.960351. It can also be noticed that, the P-value = 2.16147is greater than the significant level $\alpha = 0.05$ and the P-value = 2.71805 is greater than the significant level $\alpha = 0.05$. This concludes that the results above prove that there is no significant difference on body weight gain of broilers receiving the treatments.

The effect of aqueous extract of aloe gel (10%w/v) on growth performance, antibody titter and faecal coccidial oocytes count in coccidia infected broilers was investigated by Durrani et al. (2008). Significantly higher body weight gain, dressed weight and lower feed conversion ratio was observed for broilers in group fed with 10ml/lit Aloe gel. Findings on the effects of Aloe Vera on growth performance are inconsistent and these discrepancies can be attributed to the form of supplement (leaf powder, gel powder, or fresh gel), dosage, or whether Aloe Vera is added to feed or drinking water. However, particular attention must be paid to anti-bacterial activities and improvement in immune response as these two factors may contribute to better growth performance in broilers (Yang et al., 2009).

Chart 2: Shows the Graphical representation of body weights from week 3 to week 5



Source: Author (2019)

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As can be seen on chart (2) above there isn't much of a difference in the body weights between the treatments groups this proves that there is no significant difference on body weight gain of broilers receiving the treatments due to the fact that the broiler weights do not vary as much. Since coccidiosis may compromise growth performance, researchers have examined potential effects of Aloe Vera on improving growth performance in broilers with coccidiosis and found that Aloe Vera powder (0.1%, 0.3%, and 0.5%) added to the feed of these broilers does not lead to significant difference in terms of body weight gain (Yim et al., 2011). Darabighane and Zarei (2011) showed that adding 1.5%, 2%, and 2.5% Aloe Vera gel to the feed of broilers with coccidiosis improved FCR for these broilers compared to the control group. (Olupona et al. 2010) supplemented broiler drinking water with Aloe Vera and reported an increase in final body weight, weekly body weight gain, and average feed intake in the groups that received Aloe Vera (at 15, 20, 25, 25, and 30 cm3/dm3). In addition, improvement in FCR was observed for broilers treated with Aloe Vera compared to the control group, but the difference was not significant. (Hassanbeigy- Lakeh et al. 2012) supplemented broiler drinking water with Aloe Vera gel (0.6, 1.2, 1.8, 2.4, and 3 ml per litre) and found that Aloe Vera gel had no effect on feed intake over the total experiment period, and that the largest body weight gain and the smallest FCR was observed in the 1.8 (ml per litre) Aloe Vera gel group. On the other hand, (Sinurat et al. 2002) examined Aloe Vera gel and whole leaf added to broiler feed in both dry and fresh forms and found that adding fresh gel (0.25 g/kg) and dry gel (0.25 and 0.1 g/kg) improves FCR. (Swaim et al. 1992) found that broilers that took 10 ml aqueous extract of aloe Vera per litre of drinking water showed better performance due to diversified antimicrobial activities of aloe gel. Broilers are prone to various environmental stresses that negatively affect bird's immunity and minimize their resistance to different diseases probably due to oxidative damage of lymphoid tissues that result in impaired antibodies production. The antioxidant nature of medicinal plants (Botsoglou et al., 2001) can alleviate the negative influence of environmental stresses and can improve immune function to combat different types of diseases resulting increased growth performance.

Effect of the treatments on lesion score

Table 6: Lesion scores on day 35

DAY	35	35	35	35	35	35	35	35	35	35
T0	0.5	1	0.25	0.75	0.75	0.75	0.5	0.5	0.5	0.75
T1	0	0	0	0.25	0	0.5	0	0.5	0.25	0
T2	0	0.25	0	0	0	0	0.25	0.5	1	0
T3	0	0.5	0	0	0	0	0	0	0.25	0

Source: Author (2019)

To determine the effect of Aloe Vera on the Lesion score Ho stated that there is no significant difference in lesion scores of broilers receiving the treatments while H1 stated that there is a significant difference in lesion scores of broilers receiving the treatments. As shown on table 7 below it can be seen that there is indeed significant difference in the lesion score of broilers receiving the treatment hence Ho is rejected and gives significant remark. The lowest lesion score can be seen in AV40mls while the highest lesion score can be observed in the Control.

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Table 7; Shows the Effect of treatments on lesion Score.

AGE(Days)	CONTROL	SULPD	AV20mls	AV40mls
Day 35	5.75^{a}	1^{b}	2^{b}	0.75^{b}

Source: Author (2019)

Below is a complete randomized design Analysis of Variance (CRD-ANOVA) test which resolves the statement to whether there is no significant difference in lesion scores of broilers receiving the treatments. The H0 stated that there is no significant difference in lesion scores of broilers receiving the treatments while the H1 stated that there is a significant difference in lesion scores of broilers receiving the treatments.

Table 8: Shows the Anova Analysis for lesion score

ANOVA

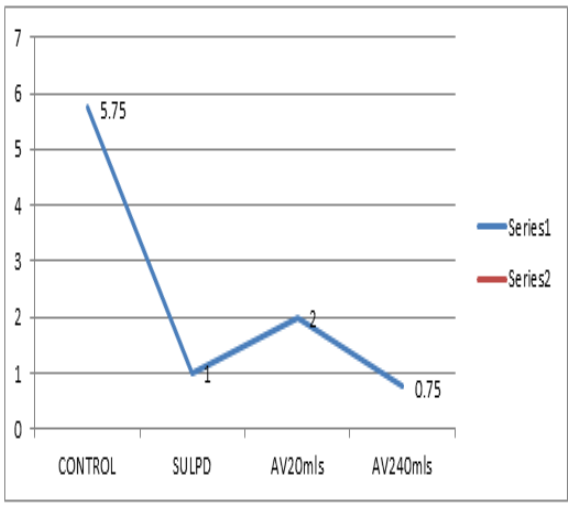
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Rows	0.79375	9	0.088194	12.43934	0.018656	2.852811492
Columns	0.079167	2	0.039583	0.850746	0.033568	0.554557146
Error	0.8375	18	0.046528			
Total	1.710417	29				

Source: Author (2019)

Table 8 above shows the results generated form Excel (2016) on ANOVA. After conducting the CRBD-ANOVA test, the results showed that there is enough proof reject the H0 since F = 12.43934 is greater than Fcritical = 2.85281 and F= 0.850746 is less than Fcritical = 0.55455. It can also be noticed that, the P-value = 0.018656 is less than the significant level $\alpha = 0.05$ and the P-value = 0.033568 is less than the significant level $\alpha = 0.05$. This concludes that the results above prove that there is a significant difference in lesion scores of broilers receiving the treatments.

In previous studies, Aloe Vera treatments displayed tonic effects on the intestinal tract by benefiting micro-flora and reducing bowel putrefaction, resulting in reduced inflammation Reynolds et al., (1999) Additionally, (Waihenya et al., 2002) reported that the guts of Aloe secundiflora-supplemented chickens were lined with a layer of Aloe material and that the chickens had fewer clinical signs and decreased mortality rates after Eimeria infection Waihenya RK et al., (2002). (Dutta et al., 2008); (Maphosa et al., 2010) also reported that Aloe ingredients also possess anti-parasitic properties in vitro and in vivo. Furthermore, a crude aqueous extract of Aloe Vera displayed ovicidal and larvicidal effects on Haemonchus contortus (Maphosa et al., 2010).

Chart 3: Shows the Graphical representation of Effect of treatments on lesion score at day 35



Source: Author (2019)

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As shown on chart 3 above the lowest lesion score can be seen in AV40mls while the highest lesion score can be observed in the Control the results prove that there is indeed a significant difference in lesion scores of broilers receiving the treatments. Akhtar et al. (2012) in there study also reported that the broilers that received aqueous extract of Aloe Vera pulp had the lowest mean score lesion in caeca and intestine in comparison to the control group and the group that received ethanol extract of Aloe Vera pulp. Furthermore, the Aloe Vera-supplemented groups showed significantly fewer intestinal lesions ($p< 0.05$) than the control group and the synthetic group following infection. The findings of this study suggest that Aloe Vera could be used an alternative treatment for controlling avian coccidiosis. The results of this work were in agreement with those of Yim et al. (2011), who tested the effects of Aloe Vera against E. maxima infection. These researchers showed that oocyte shedding and lesion scores were significantly reduced in the Aloe Vera treated groups.

Table 9; summary of analysis of variance table on body weight, oocytes count and lesion score

Parameter	week	F-Cal	F-Tab	Remark
Lesion score	5	12.439	2.92	SIGNIFICANT
Body weights	3-5	1.299	2.92	NON SIGNIFICANT
Oocytes counts	4	3.125	2.92	SIGNIFICANT

Source: Author (2019)

Table 10 above summarizes the analysis of variance on body weight, oocytes count and lesion score, it can be seen that the F-Cal and F-Tab for both the lesion score and the oocytes count are remarked as significant this is due the fact that there F-Cal is greater than the F-Tab while the body weights is remarked as non-significant as the F-Cal is less than F-Tab.

DISCUSION

Eimeria spp. is a major threat to broiler production. Infection is early in the growing (usually the first 18 days) phase destroys intestinal mucosal cells and compromises function. As a result, chicks do not grow well and the profit margin is adversely affected. Control has traditionally been accomplished by using coccidiostats either in the feed or in the water. These drugs are no longer as effective as they used to be as resistance has become an issue (Abbas et al., 2008; Blake and Tomley, 2013; Chapman, 2014). In light of this resistance, new methods for control need to be investigated. In addition, organic production has become popular and drug use is prohibited. By discovering and evaluating new non-drug alternatives, dependence on anticoccidial drugs is reduced both for traditional and organic production. Using alternatives that prove to be beneficial can prolong the efficacy of those drugs that still work which would improve the quality of life for chickens on small and large operations.

Symptoms of coccidiosis including bloody diarrhoea were more pronounced in control group (T0) compared to other treatments. Lowest lesion scores were found in AV40mls group compared to other treatments indicating that Aloe Vera had more effect than sulphadimidine. This could be due to the healing effects of auxins and gibbering hormones in Aloe Vera (Sasithanasate et al., 2009). The results showed steady reduction in oocytes counts of all

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treated groups except for the control group. This could be as result of anthraquinones in Aloe Vera interfering with the biotic potential of Eimaria ternalla.

Findings on the effects of Aloe Vera on growth performance are inconsistent and these discrepancies can be attributed to the form of supplement (leaf powder, gel powder, or fresh gel), dosage, or whether Aloe Vera is added to feed or drinking water. However, particular attention must be paid to anti-bacterial activities and improvement in immune response as these two factors may contribute to better growth performance in broilers (Yang et al., 2009), and previous studies confirm these two properties (anti-bacterial effect and improvement in immune response) for Aloe Vera. In fact, anti-bacterial properties of Aloe Vera improve intestinal micro flora and reduce pathogens, thereby changing intestinal morphology and improving growth performance. On the other hand, by improving immune response in broilers and increasing body resistance, Aloe Vera indirectly affects growth performance.

There was a significant reduction in fecal oocyte count in the treatments that were supplemented with A. Vera. The reduction in oocyte count was probably as a result of the anti-coccidial activities of the A. Vera extract. (Sungirai et al. 2013) reported similar findings in Zimbabwe with treated and untreated groups of broiler chicken with Aloe extract. Gadzirayi et al. (2010) reported similar results after adding A. Vera powder to the drinkers of experimental broiler chickens. The same author also found out that A. excelsa was as good as a synthetic coccidiostat in controlling coccidiosis. It has been reported that Aloe juice contains organic chemicals known as 1, 8 dihydroxyanthraquinone and its derivatives include Aloe emodin, aloetic acid and isobarbaloin (Hamman, 2008; Yim et al., 2011). These chemical constituents in Aloe extract act as laxative agents by interacting with the gastrointestinal mucosa and inducing bowel motility. This leads to the quick discharge of coccidial oocytes that are lodged in fecal matter thereby reducing the oocyte count. Gadzirayi et al. (2010) reported similar findings with Aloe excelsa extract. The anticoccidial activity of the aqueous extract of Aloe Vera was evaluated on Eimeria tenella and Eimeria necatrix on cell invasive property of sporozoites, In in vitro trials and the results showed that the concentration above 2.5 mg/ml significantly ($p<0.05$) inhibited the cell invasions by sporozoites of both the species (Konan et al. 2012). Yang et al. (2012) evaluated the anticoccidial activity of Aloe Vera extracts. Survival rate, oocyte per gram feces (OPG), caecum lesion score, body weight gain and anticoccidial index (ACI) were measured and calculated on the 8th day after the challenge infection. The results showed that the extract was significantly ($p<0.05$) effective against coccidian oocyte activity.

CONCLUSION

The study revealed that, the significant difference results obtained using Aloe Vera extract on coccidiosis control did not vary much compared to Sulphadimidine. Thus, Aloe Vera is a potential prophylactic agent against coccidiosis as it was effective in reducing the number of oocytes as well as reducing the lesions in broiler chickens. Yim et al. (2011) argued that through cellular mediated response, Aloe Vera can provide a more favourable effect compared to synthetics. In general, and based on the findings of the previous studies, Aloe era is regarded as a proper alternative for treating

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coccidiosis in a more economical way. The results of this study suggest that supplementation of Aloe Vera extracts at concentrations of 20mls and 40mls per 5 litres of drinking water alleviates the negative impact of Eimeria infection in broiler chickens. Since Aloe Vera extract proved to be of significant importance in fighting coccidiosis and showed a significant reduction of oocyte counts and significant reduction on intestinal lesions. Thus, the extract could be used as an organic alternative to synthetic chemicals to combat coccidiosis and improve chicken health especially for poor resource farmers.

Over time, anticoccidial drug development has increased in response to the urgent need to control avian coccidiosis. At present there are several strategies available, many of which are currently widely used in chicken farms. Moreover, new alternatives are emerging, as is the case with anticoccidial obtained from plants, fungi, or microorganisms. One of the advantages of using natural extracts is the lower risk of developing resistance, such as that observed with chemical drugs. It is widely known that the availability of raw materials and the cost of production could be high in the development of natural extract alternatives. However, the cost is well worth it considering that these alternatives are friendly to the environment, producers, and consumers.

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