

EVALUATION OF LEMON GRASS (*Cymbopogon flexuosus*) AS AN ANTICOCCIDIAL AGENT IN BROILERS PRODUCTION IN CALABAR, NIGERIA

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ABSTRACT

An assessment of the potentials of lemon grass (*Cymbopogon flexuosus*) as a possible intervention against coccidiosis of poultry was undertaken. The population for the study was made up of 60 day old (Chi—hatchery strain) broilers that were managed intensively and fed conventional feeds. At 2 weeks of age, litter materials with coccidial organisms from an infected farm were gathered, transferred, spread and mixed with the litter materials of the broilers so as to provoke natural infection in the birds. A week latter (at 3 weeks of age) the broiler birds came down with coccidiosis. The birds were then divided into 4 treatments of 15 broilers each and each group administered different concentration levels of the lemon grass extract at 0% (control), 10%, 15%, 20%. Postmortem examination was carried out prior to and after the administration of the extract of various concentrations. The mean levels of infection of the experimental birds initially were 21.5%, 32.2%, 28.6% and 21.5% for treatments 1, 2, 3, 4 respectively while the final levels of infection after the administration of the extract were 50%, 0%, 6.36% and 18.8% for treatments 1, 2, 3, 4 respectively. It was observed that in treatment 2 with 10% concentration of the extract, there was complete clearance in the level of infection while in treatment 3 (15%) concentration, the infection was reduced drastically (but not cleared). In treatment 4 (20%) level concentration of the extract, there was a very slight reduction in the level of infection as the organisms remained static while in treatment 1, the control, at (0%) concentration of the extract, there was significant increase in the level of infection. There were significant differences ($p < 0.05$) in the levels of infection after the administration of the intervention. By inference, lemon grass extract, (*Cymbopogon flexuosus*) at 10% concentration level was most effective in the treatment of coccidiosis infection in broiler birds (poultry).

KEYWORDS: Evaluation, *Cymbopogon flexuosus*, Coccidiosis, Broilers

INTRODUCTION

Any bird reared or hunted for a useful purpose is a member of the bird group called poultry (Oluyemi and Roberts, 2000). Most of these birds are domesticated and are managed on the same basic principles as the domestic fowl. The poultry industry has made tremendous strides over the decades having progressed from few birds to large commercial poultry farms of millions of birds producing a lot of eggs and poultry meat to meet customers' demands, (Dafwang and Ogundipe, 1987). Poultry keeping provided a method by which rapid transformation in animal protein consumption can be achieved in the humid tropics (Gordan, 1996). The Poultry industry has expanded tremendously within the last few decades and the expansion has been brought about by improvement in stock performance as a result of selective breeding and disease control measures adopted (Donald and North, 1986). Commercialization and the intensive nature of the industry have brought on them attendant disease conditions which have led, in no small measures to the decimation of poultry birds and loss of huge investments of money. Obioha (1992) pointed out that the occurrence of diseases in a poultry flock is a serious event and one that causes a lot of anxiety to a poultry farmer, while Gordon, (1977) stated that when commercial poultry are reared intensively, a large number of birds occupy a relatively small area, the occurrence of a disease can spread among the whole flock causing a high level of mortality and high financial losses to the farmer. Gietema (1992) reported that the incidence and importance of the different poultry diseases vary with time and that the measures that were taken to control diseases have rendered certain diseases less prominent while others have become more important. Several researchers (Bains, 1979, Bishu 1979; and Fenner, 1993) have all reported various prevalence rates of some important disease including Coccidiosis. Coccidiosis is a term used to identify the diseases produced by a group of protozoan parasite organisms in the class coccidia, North and Bell (1990). It is usually an acute infection caused

by the invasion and destruction of the intestinal mucosa by *Eimeria* or *Isospora* spp, characterized by diarrhoea, intestinal haemorrhage and emaciation, (Siegmund, 1979; West, 1979). It is a contagious, enteric, infectious disease and occurs in all domestic animals although the disease is cosmopolitan in distribution, it occurs more predominantly in the tropics. This is due to the management practices and environmental conditions in the tropics that favour the protozoan multiplication and survival on the host (Hall, 1977).

Epidemiological studies have established the economic importance of coccidiosis as a major parasitic disease of poultry in Nigeria, (Majaro, 1980) while the importance of coccidiosis is based on the economic implications of its outbreak in poultry farms (Barkish; 1989). Although coccidiosis is controllable under most circumstances, the cost of control makes the disease one of the most expensive parasitic disease encountered in the poultry industry (Majaro, 1981).

Lemon grass (*Cymbopogon flexuosus*) originated from India, though previously known scientifically as *Stipa lemoni*. It is indigenous to India and is cultivated as well in the states of Kerala, Assam Maharashtra and Uttar Pradesh (Carlini et. al., 1986). Lemon grass has three main species which are cultivated in the tropics but other sub species are available. The name lemon grass is given to this crop because of its typical strong lemon-like scent of the plants which is predominantly due to the high citral content in the essential oil present in the leaves (Souza et. al., 1986). The plants are propagated by pruned, rooted division, planted at a 1 X 0.45cm spacing (McGuffin et. al., 1997). Although regular fertilizing is necessary to keep production levels up, once established, a crop remains productive for 10-15 years (McGuffin et. al., 1997). The main chemical components of lemon grass oil are *myrcene*, *citronellal*, *geranyl*, *tate*, *nerol*, *geraniol*, *neral* and traces of timonene and citral. The oil in the leaves can easily be extracted from the fresh or partly dried leaves by steam distillation (McGuffin et. al., 1997). The therapeutic properties of lemon grass oil are analgesic, anti-

depressant, anti-microbial, anti-pyretic, antiseptic, astringent, bacteriocidal, carminative, deodorant, diuretic, fungicidal insecticidal, nervous system sedative and tonic (Lodder, 1986). It is useful for respiratory infections such as sore throats, laryngitis and fever and helps prevent spreading of infectious diseases. It is helpful with colitis, indigestion and gastro-enteritis (Carlini et. al., 1986) while all three species are also used by traditional healers to treat various diseases and infections.

This study was therefore undertaken to investigate the effects of lemon grass extract (*Cymbopogon flexuosus*), as a potential herbal intervention against coccidiosis in broiler birds.

MATERIAL AND METHODS

Location of the study

The study was carried out at the Poultry Unit of the Livestock Farm within the University of Calabar Teaching and Research Farm, Calabar. Calabar is located between latitude 4°28' and 6°55' north of the equator and longitude 7°50' and 9°28' East of the Greenwich meridian (CR Seeds, 2005).

Chicken and Housing

The population for the study was made up of 60 Day old broiler birds (Chi-hatchery strain) that were managed intensively at the poultry unit of the University of Calabar Teaching and Research Farm. The birds were given conventional broiler starter mash (supplying 22-24% crude protein) and (2800-3000k Cals metabolizable energy) (Oluyemi and Roberts, 2000) ad libitum and drinking water from day old to the 4th week and broiler finisher mash (supplying 20-22% crude protein) and (3000-3200K Cals of metabolizable energy) (Gietema, 1992) from the 5th week to maturity at 10 weeks of age. Newcastle Disease Vaccine (intraocular), Gumboro Disease (infectious Bursal Disease Vaccine (IBD), Newcastle Disease Vaccine (Lasota), and Newcastle Disease (Kamarov) were given accordingly (Siegmond, 1979). All other management practices within the pen were undertaken. At the second week of age, randomized faecal samples of the birds were taken and the results of the microscopy noted, after which infected litter materials were gathered and transferred from a farm previously infected with coccidiosis, spread and thoroughly mixed up with the litter of these birds so as to initiate infection. One week later (at 3 weeks of age) the experimental birds were confirmed microscopically and macroscopically, (Kennedy, 2001; McMullin, 2001) to have come down with Coccidiosis.

The experimental birds were randomly allotted to 4 treatments per group while laboratory examination was carried out with faecal samples obtained randomly from the 4 treatments for analysis prior to and after the administration of the intervention. Postmortem examination was also carried out on all dead birds from each group after the administration of the intervention to determine the level of coccidiosis infection. Laboratory analysis of the faeces before and after the administration of the intervention was carried out at the Veterinary Headquarters Laboratory, Barracks Road Calabar while all the Postmortem examinations were carried out on the spot at the farm for intestinal and caecal lesions.

The Plant extract

Lemon grass (*Cymbopogon flexuosus*) was collected before sunrise at the time photosynthesis had not taken place from the botanical garden of Akim Police Barracks, Calabar. One kilogram (1kg) of the lemon grass was weighed using analytical weighing balance and chopped into pieces using a knife. The chopped grass was ground using an electric grinding machine. The ground grass was placed in a vacuum

extractor for 1 hour after which the crude extract was collected at 100% concentration level. The extract was then prepared to obtain 10%, 15%, 20% concentration levels. The control (1st group of birds) had no extract and was designated 0% concentration.

Challenge Protocol

The 60 experimental broilers were randomly allotted to 4 treatments per group of 15 broilers with four replicates. Randomized faecal sampling of birds in each group was carried out as well as postmortem of birds in each group, prior to and after the administration of the intervention. Birds in each group were then administered, the various concentrations of the extract-10%, 15%, 20% while birds in the 1st group were administered no extract and therefore served as a control. The various concentrations of the extract (*Cymbopogon flexuosus*) were administered ad libitum for a period of five days.

Oocyst Output Determination and Postmortem

Laboratory examination was carried out with faecal samples taken randomly from the 4 treatments at the commencement of the experiment and after the administration of the intervention. Laboratory analysis of faecal samples was carried out using Direct Examination in saline (Edington et. al., 1981).

Statistical analysis was done using descriptive statistics such as percentages tables and means. Paired sampling to test the significance difference between the mean levels of infection before and after the administration of the intervention was done according to (Webster, 1992).

RESULTS

The level of infection of coccidial organism on the birds before the administration of the intervention as well as the results of macroscopic examination are presented (Table I).

The effect of the different concentrations of lemon grass extract (*Cymbopogon flexuosus*) on the coccidial organisms after 5 days interval is presented (Table II).

Postmortem examination carried out before and after the administration of the intervention revealed blood filled caeca while the predominant coccidial organisms present were *Eimeria mivati*, *Eimeria maxima*, *Eimeria acervulina* (in the intestines) and *Eimeria tenella* (caeca) and were accordingly reflected under (Tables I and II).

Morphology of the organisms after the administration of the extract (intervention) showed completely deformed, defaced and distorted oocysts.

Analysis of the data showed that the mean level of infection of the birds prior to the administration of the extract (intervention) for treatments 1, 2, 3, 4 were 21.5%, 32.2%, 28.6%, 21.5%, while the final mean level of infection after the administration of the extract (intervention) were 50%, 0%, 6.3%, 18.8%, for treatments 1, 2, 3, 4, respectively. There were no significant differences ($p > 0.05$) in the levels of infection prior to the administration of the extract (intervention). Mean levels of infection (Table III) after the administration of the intervention to the respective treatments showed significant difference ($p < 0.05$) between treatments with treatment 1 (control) having the highest level of infection than treatments 2, 3, 4, (after the administration of the intervention). The mean differences in the levels of infection prior to and after the administration of the intervention in treatment 2 were highly significant ($p < 0.05$) and in treatment 3, the difference in the levels of infection prior to and after the administration of the intervention were also significant ($p < 0.05$). In treatment 4, the differences in the levels of infection, prior to and after the administration of intervention were not significant ($p > 0.05$).

Table 1: Initial level of Infection before the administration of Lemon grass (*Cymbopogon flexuosus*) extract.

	Treatment 1 (0%)	Treatment 2 (10%)	Treatment 3 (15%)	Treatment 4 (20%)
Replicate I	14.3%	42.9%	28.6%	14.3%
Replicate II	14.3%	28.6%	28.6%	28.6%
Replicate III	28.6%	28.6%	28.6%	14.3%
Replicate IV	28.6%	28.6%	28.6%	28.6%
—	21.5 ^a	32.2 ^b	28.6 ^a	21.5 ^a
Mean (\bar{X})				

Postmortem: Lesion scores showed severe intestinal haemorrhages and blood filled caeca at postmortem.

Table 2: Final Level of infection after the administration of Lemon grass (*Cymbopogon flexuosus*)

	Treatment 1 (0%)	Treatment 2 (10%)	Treatment 3 (15%)	Treatment 4 (20%)
Replicate 1	50%	0%	25%	25%
Replicate 2	75%	0%	0%	0%
Replicate 3	50%	0%	0%	25%
Replicate 4	25%	0%	0%	25%
—	50 ^a	0 ^c	6.3 ^c	18.8 ^b
Mean (\bar{X})				

* Value in the same row bearing different superscript ($p < 0.05$) are significantly different.

Postmortem: Lesion scores and haemorrhages of both intestines and caeca were absent in Treatment 2 (10% concentration), mild in Treatment 3(15%) but severe in Treatments 1 & 4 (0% and 20% respectively)

Table 3: Difference in the means of levels of infection before and after administration of lemon grass (*Cymbopogon flexuosus*) extract.

Treatment	Mean of level of infection before the administration of extract	Mean of level of infection after administration of extract	t. cal	t. crit
1(0%)	21.5 ^a	50 ^b	40.75	3.707
2 (10%)	32.2 ^a	0 ^b	11.93	
3 (15%)	28.6 ^a	6.3 ^b	21.41	
4 (20%)	21.5 ^a	18.8 ^b	1.45	

* a, b Means along the rows with different superscript are significantly different ($p < 0.05$)

DISCUSSION

The results of this study showed that gross macroscopic lesions observed prior to the administration of the intervention in all the replicates of the various groups were similar and of mild to moderate levels of infections indicating mild haemorrhagic foci of the small intestines and caeca.

A comparison of the initial and final levels of infection (Tables 1 and 2) as well as the mean levels of infection prior to and after the administration of the intervention (Table 3) showed that in the First Treatment (Treatment 1) designated (control), the parasitic Oocyte level increased tremendously indicating there were significant differences in the infection rate ($p < 0.05$). The parasitic infection rate rose from a mean level of 21.5% prior to the administration of the intervention to 50.0% after the administration of the extract. Due to the absence of an intervention in this treatment, the coccidial organisms were able to increase and reproduce copiously without hindrance, hence the increased rate of infection from 21.5% to 50% ($p < 0.05$).

In treatment 2 (10%) the parasitic Oocyte level was reduced from a mean infection rate of 32.2% to 0% ($p < 0.05$) implying that no infection was left after administering the intervention for 5 days. The extract at the 10% concentration level was able to completely wipe out or clear the organisms.

In treatment 3 (15%) concentration of the extract, the mean infection rate was reduced from 28.6% prior to the administration of the extract to 6.3% after and these differences were significant ($p < 0.05$). The implications were that the concentration of the extract was not potent enough to give full clearance of the coccidial organisms hence the infection still persisted.

In treatment 4 (20%), the mean level of infection prior to the administration of the extract was 21.5% while the final

level of infection was 18.8%, the differences were not significant ($p > 0.05$). The intervention at that level was ineffective against the coccidial organisms. Although growth of the organisms was arrested and thus static, the organisms were deformed and defaced.

When the difference in the means of levels of infection before and after the administration of lemon grass (*Cymbopogon flexuosus*) are compared (Table III) the statistical significance became relevant. From the study and (Table III) it was found that it is only in the 4th treatment where the mean differences before and after the administration of the extract were not statistically significant ($p > 0.05$).

Of all the various levels of concentrations, Treatment 2 (T2) with 10% concentration of the extract (*Cymbopogon flexuosus*) was the most effective, since all the organisms inside the host were completely cleared during the final faecal analysis. These observations collaborate the findings of (Sprent, 1986) that for any intervention to be effective, it must be able to clear about 80% of the parasites for which it was administered.

There is need for further studies to be conducted using various concentrations of *Cymbopogon flexuosus* on different parasitic organisms in broilers and pullets or layers. Only after that can its true efficacy or potency by actually established.

CONCLUSION

Although this preliminary study has indicated that *Cymbopogon flexuosus* extract at 10% level concentration has shown some promise against coccidial infection in broiler birds, more studies need to be carried out before conclusive evidence is adduced

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