

Massive Expulsion of Gastrointestinal Parasite Eggs and Oocysts from Infected Chickens using Extracts of *Allium sativum* and *Thymus vulgaris*.

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ABSTRACT.

The juice extracts of *Allium sativum* (garlic) cloves and the leaves of *Thymus vulgaris* (thyme) in combination, was administered to domestic fowls (*Gallus gallus domesticus*) infected with some gastrointestinal parasites notably, *Ascaris* sp- and *Eimeria* sp. The use of these plants was based on some known, speculative and/or reported activities of their extracts on the helminthes and protozoan parasites of man and other animals. Faecal droppings (faeces) from 120 test birds, with symptoms of GIT parasites were collected, examined and analyzed using egg concentration/floation method, direct smear method and the McMaster counting technique. Some of the symptoms were anaemia, poor absorption of food, weight loss, reduced egg production etc. Four groups of 30 birds were investigated, including, the ASG, TVG, ATG and the CG. At very low concentration of 50g, the mixture of both plants extracts (ATG) caused the expulsion of high number of eggs/oocysts between 12,000 and 25,000 per gram of faeces within the first three days of the test period. On the other hand, birds administered with only *Allium sativum* extracts (ASG), expelled 1000-7000 eggs/oocysts within 5 days, while for *Thymus vulgaris* (TVG), there were 1000-6000 eggs/oocysts voided within 6 days. The effects of the individual plant extracts on the parasites improved when their concentration was increased. However, the control group (CG), which was administered with neither plant extracts nor any anti parasitic agent, continued to excrete varying numbers of eggs/oocysts even after the test period. The combined crude extracts of *Allium sativum* and *Thymus vulgaris* (ATG) also caused distortions on the parasite's egg coats rendering them non-viable. Less intense faecal odour was also observed on the treated birds. Postmortem investigations of the treated birds showed some dead larvae and adult parasites in their intestinal mucosa.

Keywords: Domestic Chicken, GIT Parasites, *Allium* sp. Oocyst, *Ascaris* sp, *Thymus* sp. *Eimeria* sp.

INTRODUCTION

The avian species, especially the poultry group and most especially the domestic fowls have been associated with man from history (Elenwo, and Okafor-Elenwo, 2014a). They are found to be as useful as fish, snail and some other livestock in meeting the needs of man in terms of his nutritional, economic and other related needs (Okafor-Elenwo and Izevbuwa, 2021a). Helminths (worms) and protozoa (especially those that cause coccidiosis) that infect the gastrointestinal tract of birds often spread from the environment to the birds and/or from an infected-chicken (Hansen 1994; Williams, 1995; Chapman, 2014; Elenwo and Okafor-Elenwo, 2014b). This transmission is achieved through the faeces or through a variety of intermediate hosts which include snails, earthworms, flies and insects. They occupy choice sites in the intestines and body tissues, where they cause a decrease in food intake, weight loss, reduced egg production and even the death of their host (Elenwo and Okafor-Elenwo, 2015; Cervantes *et al.*, 2020).

Gastro-intestinal parasites are the most prevalent and most devastating parasites affecting chicken productivity in the world, especially the tropics and most especially tropical Africa (Schillhom Van Veen, 2003; De Pablos *et al.*, 2010; Elenwo, and Okafor-Elenwo, 2014c). They cause anaemia due to blood loss, and can cause damage directly by causing diarrhoea, poor absorption of nutrients, anorexia and enteritis (Attree, *et al.*, 2021; Okafor-Elenwo *et al.*, 2021b). The chickens affected by the disease exhibit low growth rates and low egg production, and in chicks high mortality is predominant (Umeh, and Odo, 2002; Elenwo and Okafor-Elenwo, 2014d). Oftentimes farmers are challenged by the nature of the conventional anti-parasitic drugs which are either very expensive or have some side effects and also are easily resisted by the parasites (Vinay, *et al.*, 2013; Okafor-Elenwo *et al.*, 2023b). This has led to the search for other cheaper alternatives such as medicinal plants (Rezaei *et al.*, 2010; Elenwo and Okafor-Elenwo, 2013).

There is a renewed interest in the use of plant extracts in the control of animal diseases (Yim *et al.*, 2011; Ola-Fadunsin and Ademola, 2013). The benefits from medicinal plants include availability, affordability, non-toxic, environmentally friendly and not easily resisted by disease agents (Asuzu and Onu, 1993; Youn and Noh, 2001; Elenwo and Okafor-Elenwo, 2014d). Animal breeders /farmers lose millions of money annually due to problems of (or associated with) gastro-intestinal parasites. In the long run, the extracts from plants may help in addressing the problem of diseases, especially parasitic disease (Okafor-Elenwo and Izevbuwa, 2021c; Okafor-Elenwo *et al.*, 2023a).

Communications from local healers and few studies have indicated that garlic and thyme, which are food spices consumed by human beings could be used in the treatment of many diseases including bacterial, fungal, viral, parasitic and other microbial diseases especially, in humans. Information on the specific use of these plants in the control of gastro-intestinal parasitosis of the domestic-fowls is very scanty.

This research study evaluated garlic and thyme extracts for their possible uses in the control of G.I.T helminthes and coccidian parasites of the domestic fowl (*Gallus gallus domesticus*: galliformes).

MATERIALS AND METHODS

Collection of Chicken Samples

One hundred and twenty birds were randomly collected from poultry farms located in Okada, (McOTE -RIO FARMS and OSIUGENE POULTRY FARMS) the headquarter of Ovia

North East Local Government Area, Edo State. They were divided into three treatment groups, ASG (*Allium sativum* group); TVG (*Thymus vulgaris* group); ATG (*Allium* & *Thymus* group) and the (Control group). The treatment groups were administered with equal amount of the test plants' extracts. After, the treatment, the bird's faeces (1g from each bird), was collected and analysed for the presence of the parasitic eggs/ or oocyst.

The choice of a particular chicken for this study was based on the examination and confirmation of the practicing veterinary doctors who observed the symptoms and associated the sick chickens with coccidiosis. The signs observed were frank-blood on the faeces, brownish-discolouration and pasty faeces, relatively soft or diarrhoeic faeces passed-out by the birds, signs of weight loss as they were feeling quite light when lifted up with the hand, compared to the healthy ones. The sick birds were also observed to be dull, emaciated and not feeding, plate 1.

Examination of the birds

Examinations were carried out to ascertain the presence or otherwise of the G.I.T.-parasites. Post-mortem examination was carried out on few randomly selected birds to ascertain the presence of the parasites in the birds used in this work. The presence of some adult helminthes (particularly nematodes), and lesions usually associated with the presence and activities of coccidial parasites confirmed the presence of helminthosis and coccidiosis in these birds.



Plate 1. Photograph of infected chickens



Plate 2. *Allium sativum* (Garlic) bulb



Plate 3 . *Thymus vulgaris* (Thyme) leaves

Analysis of the birds faeces

Preparation of the plant materials and the analysis of faecal specimens were carried out using the procedures earlier reported (Okafor-Elenwo et al., 2023a). Each of the plants whose extract was used was subjected to the LD-50 test to ascertain their limits of safety for the birds even though they are safe for the humans. The number of eggs per gram of faeces for each parasite species was calculated by multiplying the number of eggs counted in the McMaster chambers by the factor 50. (Okafor-Elenwo et al., 2023a)

RESULTS

Mean Eggs and Oocysts voided at different concentrations of the Test plant extracts mixed with Chicken feed.

The excretion of GIT parasite eggs by the test birds after the administration of garlic and thyme extracts was frequent and heavy, figures 1. and 2. The numbers of eggs and oocysts voided increased as the concentration of the extracts increased. The main parasitic groups identified were *Eimeria* sp. (coccidial) and *Ascaris* sp (helminth), figures 3 and 4. Comparatively, chickens fed with mixtures of the test plant extracts and the compounded feed passed out more eggs and oocysts. At different concentrations of the test plant, *Allium sativum* (garlic) -fed birds shed more eggs and oocysts and cleared within few days, compared to those fed with *Thymus vulgaris*. The situation was much different with the untreated birds, the parasite count in them was lower but consistent.

Effects of Test-plants on the Parasites per gram of Faeces

Birds fed with garlic extracts (*Allium sativum*) shed higher number of helminth eggs by day one and two. From the third day to the fourth day, eggs voided were less. From the fifth day there were no eggs, table 1. The ones that received the extracts of *Thymus vulgaris* also released helminth eggs up to the fifth day (60th hour). On the other hand, birds fed a mixture of *Allium sativum* and *Thymus vulgaris* extracts, shed more eggs than when the plants were considered separately, table 1. Birds in the CG (control) group were fed with poultry feed

only, without adding plant extracts. They continued to excrete helminth eggs until the test period elapsed.

Coccidial oocysts count per gram of faeces in birds fed with *Allium sativum* was also high. From the third day of feeding, the egg excretion reduced and thereafter stopped. Birds fed with *Thymus vulgaris*, as well, voided high number of oocysts, table 2. Coccidial oocysts were excreted massively by the birds administered with a combination of *Allium sativum* and *Thymus vulgaris* extracts. The control group of birds consistently shed the parasitic agents with progressive increase as the test period elapsed, table 2.

Generally, the total coccidial oocysts and helminth eggs voided were higher in birds administered with *Allium sativum*, figures 2 and 3. Comparatively, *Allium sativum* extract in combination with *Thymus vulgaris* extracts took just a few days to clear the gastrointestinal parasites from the test birds, as shown by the absence of the eggs or any developmental stages in the birds faeces.

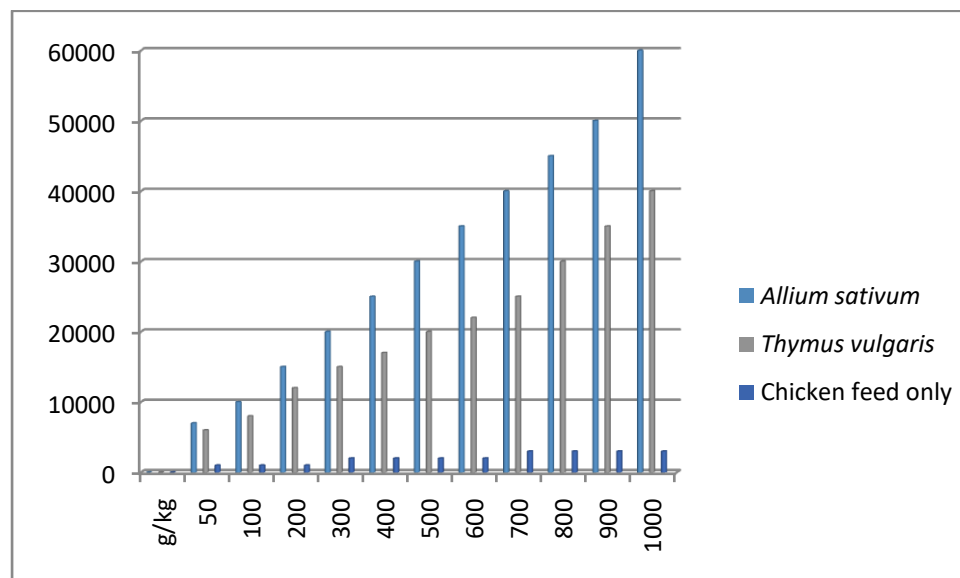


Figure 1. Mean coccidial oocysts voided at different concentrations of the test Plant extracts mixed with chicken feed

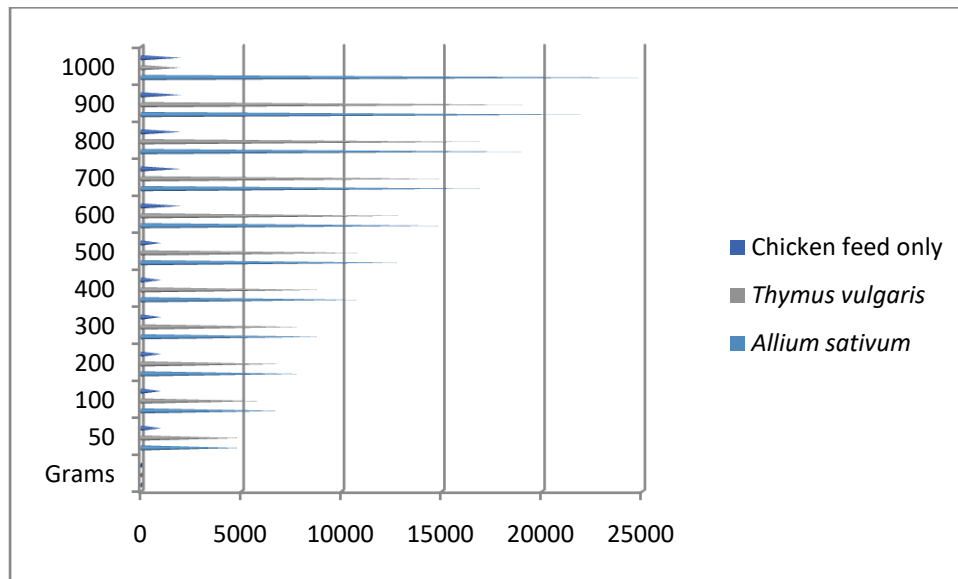


Figure 2. Mean Helminth eggs voided at different concentrations of the test Plant extracts mixed with chicken feed

Table 1. The total helminth ova voided per gram of faeces after administering 50g of the test plants extracts.

PLANT-EXTRACT	DAYS OF ADMINISTERING TEST-PLANT EXTRACTS TO INFECTED BIRDS AND NUMBER OF OVA VOIDED PER BIRD PER DAY						
	DAY 1 (12hrs)	DAY 2 (24hrs)	DAY 3 (36hrs)	DAY 4 (48hrs)	DAY 5 (60hrs)	DAY 6 (72hrs)	DAY 7 (84hrs)
<i>Allium sativum</i>	H.E.	H.E.	H.E.	H.E.	H.E.	H,E,	H.E.
	3,000 epg	6,000 epg	4,000 epg	2,000 epg	00 epg	00epg	00epg
<i>Thymus vulgaris</i>	2,000 epg	5,000 epg	6,000 epg	3,000 epg	1,000 epg	00 epg	00 epg
<i>Allium sp & Thymus sp combined</i>	12,000 epg	21,000 epg	3,000 epg	00 epg	00 epg	00epg	00epg
NEGATIVE CONTROL	1,000epg	1,000 epg	1,500 epg	1,500 epg	2,000 epg	2,000 epg	3,000 epg

NOTE: H.E. = Helminth-Eggs; EPG= eggs (voided) per gram of faeces.

Table 2. The total coccidial-oocysts voided per gram of faeces after administering 50g of the test plants extracts for 7days.

Plant-Extract	Days of administering test-plant extracts to infected birds and number of oocysts voided per bird per day						
	DAY1 (12hrs)	DAY2 (24hrs)	DAY3 (36 hrs)	DAY4 (48hrs)	DAY5 (60hrs)	DAY6 (72hrs)	DAY7 (84hrs)
<i>Allium sativum</i>	C.O.**	C.O.**	C.O.**	C.O.**	C.O.**	C.O.**	C.O.**
	5,000 opg	7,000 opg	4,000 opg	2,000 opg	1,000 opg	00 opg	00 opg
<i>Thymus vulgaris</i>	3,000 opg	6,000 opg	4,000 opg	3,000 opg	1,000 opg	00 opg	00 opg
<i>Allium sp. & Thymus sp. combined</i>	10,000 opg	25,000 opg	22,000	2,000	00 opg	00 opg	00 opg
Negative Control	1,500 opg	1,500 opg	2,000 opg	2,000 opg	2,500 opg	2,500 opg	3,000

NOTE: CO. = COCCIDIAL-OOCYSTS; opg = oocysts (voided) per gram of faeces.

DISCUSSION

General observations of the sick birds after administration of the test-plant extracts, showed some level of improvement. This was based on the visible/gross effects of the test-plants over the period of treatment. The birds' appetite greatly improved, as they were observed to be feeding and drinking better. Also, the treated bird's faeces had less foul odour compared to the untreated ones. The control group remained weak and some died within the period because they were not administered with any of the test-plants.

The use of indigenous plant preparations as alternative means of health maintenance for humans and animals are presently gaining grounds (Lee *et al.*, 2007; Soetan *et al.*, 2011). Studies show that plant materials are cheap, available, sustainable and not easily resisted by disease agents (Okafor-Elenwo, *et al.*, 2023b)

Medicinal plants research has become one of the necessary areas of study at present globally. A host of indigenous plants are currently in use and many more are being tested for medical and veterinary benefits (Reza *et al.*, 2010; Okafor-Elenwo, *et al.*, 2023b). They are often used in traditional medicine in many countries of the world. Due to the huge importance of most plants and their extracts, there is the need to sustain and conserve them (Soetan *et al.*, 2011; Elenwo, and Okafor-Elenwo 2015; Okafor-Elenwo, *et al.*, 2021b). Elaborate use of plant extracts and products have been reported. For example, *Parkia biglobosa* (African locust bean plant) is a multipurpose tree of West Africa and is used for nutritional and medicinal purposes. The inhibitory effects of condensed saponins on hatching of eggs of bovine gastrointestinal nematodes *in vitro* was reported in 2003 by Lasisi and colleagues. Also

reported is the activity of some herbs against coccidiosis and helminthiasis in domestic birds (Elenwo and Okafor-Elenwo, 2015). Adedapo *et al.* (2007), studied the anthelmintic efficacy of the aqueous crude extract of *Vernonia amygdalina* (bitter-leaf plant), and showed that it significantly reduced the faecal egg count of *Toxocaracanis* (ascarids) and *Ancylostoma caninum* (hookworm).

From our observation during the present research, it was noted that treated birds had little or no egg loads and excreted none toward the end of the research period. The impression given here is that, the plant extracts used in this exercise were effective against the parasites and flushed the gut of the birds within few weeks of the administration, dislodging much of the parasitic agents through their faecal materials. Conversely, the control groups which did not consume the plant extracts continued to excrete the parasites which gets in contact with the birds' faeces until the test period was over. The foregoing, showed that *Allium sativum* and *Thymus vulgaris* were probably responsible for the expulsion of the parasitic eggs and ova recorded in this research.

Apart from the effects of the plant-extracts on the number of the helminth-eggs and coccidial-oocysts shed, the morphology of the helminth eggs and coccidial oocysts were also observed to have been adversely affected, with the consistency of their covering membranes disintegrated. Faecal droppings were also observed to have less foul /intense odour compared to the untreated birds.

Conclusion.

The test-plants showed some of dose/concentration-dependent effects on the GIT parasites of domestic chickens. The adverse effects of *Thymus vulgaris* and *Allium sativum* increased when combined in the feed and/or water. This seems to suggest that if these plant-materials are consistently incorporated in the water or feeds of the domestic birds, especially in commercial ventures, the presence of the studied-G.I.T-parasites and the problems associated with such in the domestic fowl production would eventually be completely eliminated, or reduced to level of insignificance.

CONTRIBUTIONS BY THE AUTHORS

Okafor-Elenwo, E. J. Designed the experiment and wrote the manuscript, Nwokedi, R. E, guided, reviewed the paper and provided some background information. Izevbuwa, O. E. supervised the laboratory procedures and reviewed the manuscript

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