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Full Length Research Paper

Anthelmintic efficacy of pawpaw (*Carica papaya*) seeds in commercial layers

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The anthelmintic efficacy of the aqueous and crude extract of *Carica papaya* seeds was studied in 40 Isa Brown commercial layers infected naturally with nematodes. They were randomly divided into 4 groups: A, B, C and D with 10 birds per group. Group A birds were untreated, while groups B, C and D were treated orally with proprietary anthelmintic (piperazine 322 mg/kg body weight/day), powdery (300 mg/day/bird) and aqueous (1:10 ml water required/day) extracts of *C. papaya*, respectively. Two weeks after treatment, blood and faecal samples were collected to evaluate for hematological values and faecal egg counts respectively. The results of this study showed that the powdered and aqueous extract of *C. papaya* after its administration, produced a significant increase ($P < 0.001$) in packed cell volume, red blood cells, haemoglobin concentration, lymphocyte counts and significant decrease in eosinophil counts. The faecal egg counts also showed a remarkable and significant reduction in the levels of the identified helminths. The reduction in faecal egg counts was more pronounced with the aqueous extract than crude extract administered. The effects of the *C. papaya* seed extracts in this study therefore showed that *C. papaya* extracts can serve as a source of chemical substance for use in the development of effective anthelmintic agents.

Key words: *Carica papaya,* anthelmintic, piperazine, helminths, haematology.

INTRODUCTION

Poultry is an integral part of livestock farming in Nigeria which entails rearing of different classes of birds. The chickens are the most globally recognized of all classes of poultry birds (Adu, 1997). According to the world livestock population statistics of 1987, the population of chicken was estimated to be 9.445 billion. The chickens are the most globally recognized of all classes of poultry birds and the FAO (1987) source claimed that more than 90% of the world flock consists of chicken. It is unequivocal to say that the poultry enterprises contribute considerably to the livestock industry vis-a-vis agriculture, which hitherto serves as the bedrock of the world economy. Chicken (*Gallus* spp.), duck (*Anas platyrnchos),* guinea fowls (*Numida melearis),* pigeons (*Coluba livia)*, quails (*Coturnixcoturnix)* and turkeys (*Meleagris gallopavo)* epitomize the concept of micro-livestock. The importance of diseases in the economics of a poultry farm needs no justification and the internal parasites causing diseases in livestock can be classified into three: the nematodes (round worms), cestodes (tapeworms) and trematodes (the flatworms) (Jordan and Pattison, 1996). Scientific studies have proven that a number of plants used in human ethnomedical practice have pharmacological activities (Ballantine et al., 1999) and may also be useful as ethno-veterinary remedies (Gefu et al., 2000; Udem and Opara, 2001; Hassan and Zalla, 2003). Nwude and Ibrahim (1980) compiled information on plants used in traditional veterinary medicine in Nigeria. More of this type of work should be done to identify plants used in various localities to treat animal diseases. These plants should be investigated for their efficacy and toxicity. Those found effective with minimal toxicity should be processed for use in veterinary practice (Nwude, 1997). The methanol extract of *Morinda lucida* and aqueous extract of *Alstonia boonie* bark each play an active role against *Trypanosoma brucei* in mice

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(Asuzu and Chineme, 1990; Asuzu and Anaga, 1991). Nok et al. (1993) also reported on the trypanocidal potentials of *Azadirachta indica* leaf extract against *T. brucei*. Thirteen plant species were used as anthelmintics and nine were used to combat worm infestation in livestock and these include *Carica papaya*, *Allium satirum, Areca catecha, Ananas comosus*, *Nicotiana tabacum, Cucurbita moschata* (Adedapo et al., 2002). Among these botanical specie, *C. papaya,* (pawpaw) may be preferred to as an ethno-veterinary remedy in this part of the tropics because of its adaptability, agro-ecological considerations and availability (Mundy and Murdiati, 1991) and the antihelminth efficacy of *C. papaya* latex in poultry had been reported (Adu et al., 2009), but this study focused on the anthelmintic potency of these seeds either in aqueous or powdery forms in commercial layers.

MATERIALS AND METHODS

Preparation of the *C. papaya* seeds

The seeds were collected freshly from ripe pawpaw fruits and washed with clean water to remove dirt. The seeds were sundried and later grinded into powdery forms. The pawpaw seed powders were weighed (75 g), and blended into liquefaction in 150 ml of distilled water. The mixture was then centrifuged at 1500 rpm. The supernatant was filtered through sterile filter papers into a conical flask as the study extract. One milliliter of the filtrate is expected to contain 0.5 g (500 mg/ml).

Proprietary anthelmintic piperazine

The daily dosage of piperazine for therapeutic use in poultry is 322 mg/kg body weight. Bird weighing 1.30 kg, therefore received 418.6 mg of the active ingredient per day (Bains, 1979; Jordan and Pattison, 1996).

Experimental animals

Forty (40) commercial layers of 24 weeks old used in this study were procured from the local farm in Ogbomoso, Oyo State, Nigeria with history of no previous deworming. They were kept in concrete-floored, clean and separate pens in the Lautech Teaching and Research farms, where adequate water and feed was supplied. The pen was cleaned and fumigated before the birds were installed.

Haematological and parasitological analysis

Faecal sample of each bird was collected in labelled sterile universal bottles for identification of the type of helminths eggs present using flotation techniques. Blood samples were also collected from each animal into labelled EDTA bottles for haematology. After 2 weeks initial stabilization, the baseline haematological and coprological evaluations were made.

The flotation method, which involved the use of salted (NaCl) water, was used to determine the helminth eggs present in the faecal samples, while the modified McMaster egg-counting technique was used for nematode counts. In determining fluke count, the modified McMaster egg-counting technique as used for nematode counts was employed.

Blood samples were collected from the jugular vein of each bird using 5 ml syringes and 25-gauge needles into appropriately labelled EDTA bottles. Estimation of haemoglobin (Hb) concentration was by Sahli's method. Erythrocytes and leucocytes were counted manually using Neubau's haemocytometer. Packed cell volume (PCV) was determined by the conventional method, that is, the microhaematocrit method and leucocyte differential counts were also determined (Mitruka and Rawsley, 1977; Jain, 1986).

Animal grouping and treatment

The birds were divided into 4 groups (A, B, C and D) with 10 birds per group. Group A received no medication, Group B were treated with piperazine at 322 mg/kg body weight/day. Group C had the extract administered as feed additives at 300 mg per day (Adu et al., 2009), while Group D were administered orally with the aqueous crude extract of *C. papaya* at 1:10 ml of water. Both the drug and the extracts were administered for 3 consecutive days. This procedure was repeated after 2 weeks. The procedure was again repeated two weeks later.

Statistical analysis

Results are expressed as the mean of parameters ± standard error of the mean (SEM). Differences between means were evaluated using the "ANOVA" tests to determine multiple comparisons which were also used. Differences are significant at $P < 0.001$ (Bradford and Hill, 1991).

RESULTS

Faecal egg counts

The study showed that all the birds were heavily infested with worms ranging from *Heterakis gallinarium, Trichostrogylus tenius* to *Ascaridia galli*. Administration of drug and *C. papaya* powder and aqueous extracts produced a significant reduction in the faecal egg counts and by the second administration, Groups B and D animals were effectively dewormed, but Group C animals were not effectively dewormed. ANOVA tests showed that when all the identified helminths were compared between groups and within groups, the differences were significant at $p < 0.001$ (Table 1).

Haematological reports

Haematological results showed that before treatment, the PCV mean values for animals in Groups A, B, C and D were 20.00 ± 0.50, 24.00 ± 0.6, 23.00 ± 0.4 and 23.00 ± 0.2. After treatment, this parameter showed a significant increase. For haemoglobin, pre-treatment values for Groups A, B, C and D were 6.30 ± 0.4, 7.5 ± 0.5, 7.4 ± 0.3, and 7.4 ± 0.5, respectively. After treatment, this parameter also showed a significant increase. In the case of the red blood cell (RBC), the mean values for Groups A, B, C and D before treatment were 2.6 ± 0.3, 2.5 ± 0.1, 2.5 ± 0.2 and 2.5 ± 0.1, respectively. Like the other 2

Table 1. Faecal egg counts of experimental layers during drug /*C. papaya* trials.

Organism	Group	Baseline	1st 2 week	2nd 2 week
Heterakis gallinarum (egg)	A	2800 ± 6.50	2700 ± 0.40	2800 ± 0.50
	B	2250 ± 0.40	-	-
	C	2000 ± 0.40	1500 ± 0.20	200 ± 0.40
	D	2500 ± 0.21	-	-
Ascaridia galli (egg)	A	1800 ± 0.40	1900 ± 0.40	2000 ± 0.50
	B	1500 ± 0.30	-	-
	C	1600 ± 0.20	400 ± 0.20	-
	D	1600 ± 0.40	-	-
Trichostrongylus tenius (egg)	A	800 ± 0.20	1000 ± 0.20	1200 ± 0.40
	B	700 ± 0.40	-	-
	C	700 ± 0.40	200 ± 0.20	-
	D	700 ± 0.70	-	-

Results expressed as means ± SE; 1st 2 weeks after administration of drug/*C. papaya* extracts; *2nd 2 weeks after 2nd administration of drug/*C. papaya* extracts; Animals in group A did not receive any treatment.
papaya extracts; *2nd 2 weeks after 2nd administration of drug/*C. papaya* extracts; Animals in group A did not receive any treatment.

parameters, RBC also showed a significant increase after treatment. Lymphocyte values showed increasing levels, while eosinophil values declined with drug and powder and aqueous extracts administration. ANOVA tests showed that when all the haematological parameters were compared between groups and within groups, the differences were significant at $p < 0.001$ (Table 2).

DISCUSSION

This study has clearly shown that commercial layers are heavily infested with worms, except when treated with appropriate anthelmintics. Helminths infection manifested general clinical signs such as lethargy, dullness, inappetence, loss of general body condition, roughed feathers, pallor of visible mucous membrane, loss of weight and fall in egg production (Jordan and Pattison, 1996), etc. This necessitated the urgent need for treatment (Jordan and Pattison, 1996).

The powder and aqueous extracts administered in this study caused a significant reduction in the worm burden of the birds. Group D animals particularly experienced more significant reduction in worm burden than Group C animals. This effect was also noticed after the second administration of the powder and aqueous extracts. This observation may be due to the fact that birds may not pick entire doses applied in additive forms unlike aqueous oral doses that had direct entry into the gastrointestinal tract where helminthes were located. Therefore, there is a direct contact of the aqueous extract with the helminthes parasites in the intestinal tract. It thus demonstrated that the aqueous oral route of administration should be preferred with respect to this extract. It must be stressed, however, that the effect of the proprietary anthelmintic is more pronounced on the worm than those of the powdery and aqueous extracts of *C. papaya*. The reduction of helminths' egg loads observed with the powdery and aqueous extracts of *C. papaya* on birds in Groups C and D may be attributed to the presence of papain in the seeds of *C. papaya* and this is possible because papain is capable of digesting bacteria and parasitic cells, hence its use as an anthelmintics and antibiotics as reviewed by (Fajimi and Taiwo, 2005). Administration of the drug and extracts resulted in a remarkable improvement in the haematology of birds in Groups B, C and D because the helminth eggs that were responsible for reduction in the levels of these haematological parameters have been removed to some extent. It thus becomes natural that through haemopoeisis, the parameters will begin to appreciate with time (Halton, 1974; Oyerinde, 1980; Barriga and Omar, 1992).

Reduction of the helminth eggs by the powdery and aqueous extracts of *C. papaya* in this study is a positive and welcome development in our local helminths struggle because its fruits and seeds are available all-year round in Nigeria. The easy access to this plant and its availability might mean that the cost of medication would have been drastically reduced. The powdered and aqueous extracts exhibited a high degree of broad spectrum, which implies that total reliance on proprietary drugs, which in most cases are imported, will be reduced. It also means that the risk of drug resistance could to

Table 2. Haemogram of experimental layers during drug/*C. papaya* trials.

Parameter	Group	Baseline	1st 2 week	2nd 2 week
PCV (%)	A	20.00 ± 0.50	21.00 ± 0.60	22.03 ± 0.30
	B	24.00 ± 0.60	29.00 ± 0.50	33.00 ± 0.20
	C	23.00 ± 0.40	27.00 ± 0.50	30.00 ± 0.40
	D	23.00 ± 0.20	29.00 ± 0.50	33.00 ± 0.50
HB (g/dl)	A	6.30 ± 0.40	6.40 ± 0.20	6.4 ± 0.30
	B	7.50 ± 0.50	8.0 ± 0.30	10.0 ± 0.40
	C	7.40 ± 0.30	8.1 ± 0.40	8.2 ± 0.40
	D	7.40 ± 0.50	9.2 ± 0.30	11.0 ± 0.20
RBCx10^6/mm3	A	2.6 ± 0.30	2.4 ± 0.20	2.4 ± 0.10
	B	2.5 ± 0.10	3.6 ± 0.40	4.2 ± 0.30
	C	2.5 ± 0.20	3.4 ± 0.20	3.9 ± 0.30
	D	2.5 ± 0.20	3.7 ± 0.20	4.0 ± 0.40
Lymphocyte (%)	A	50 ± 0.50	45 ± 0.30	45 ± 0.40
	B	48 ± 0.40	50 ± 0.10	52 ± 0.10
	C	48 ± 0.40	51 ± 0.20	53 ± 0.10
	D	49 ± 1.20	52 ± 0.20	53 ± 1.20
Eosinophil (%)	A	2.1 ± 0.20	2.1 ± 0.20	2.2 ± 0.20
	B	2.2 ± 0.20	-	-
	C	2.2 ± 0.10	1.2 ± 0.20	1.4 ± 0.40
	D	2.2 ± 0.30	-	-

Results expressed as means ± SE; 1st 2 weeks after administration of drug/*C. papaya* extracts; *2nd 2 weeks after 2nd administration of drug/*C. papaya* extracts; Animals in group A did not receive any treatment.
PCV, packed cell volume; RBC, red blood cell, HB, haemoglobin.

some extent be avoided.

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