ISSN 1682-8356
ansinet.org/ijps

INTERNATIONAL JOURNAL OF

POULTRY SCIENCE

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorijps@gmail.com

International Journal of Poultry Science 10 (9): 730-733, 2011
ISSN 1682-8356

Physiological Response of Broiler Chickens to Neem (*Azadirachta indica*) and Akakapenpen (*Rauvolfia vomitoria*) Decoctions: Performance and Carcass Characteristics

H.K. Zanu, J.K. Kagya-Agyemang, W.K.J. Kwenin, F.R.K. Bonsu, E. Antwi and S. Ateni
Department of Animal Science Education, University of Education, Winneba,
P.O. Box 40, Mampong-Ashanti, Ghana

Abstract: A 6-week feeding trial was conducted on One hundred and eighty (180) Cobb broilers to evaluate the effects of Neem *(Azadirachta indica)* decoction (AID) and Akakapenpen (*Rauvolfia vomitoria*) decoction (RVD) on body weight gain, carcass and organ characteristics and haematological values of broiler chickens. The leaves of *Azadirachta indica* and *Rauvolfia vomitoria* were harvested and dried in the sun until they became crispy but still greenish in coloration. They were washed and then boiled (40 g of chopped leaves in 9L of water). The decoctions were placed in separate sterilized bottles ready for use and were offered *ad libitum*. The birds were randomly distributed to the treatments with twenty (20) birds per replicate, with each treatment replicated three times in a Completely Randomized Design (CRD). The total replacement of antibiotics and coccidiostat resulted in non-significant depression ($p<0.05$) in final body weight and weight gain in experimental birds. However, feed intake was slightly affected ($p<0.05$) by administration of RVD to broilers. There was no significant effect of decoctions on water intake, feed conversion efficiency and mortality. Decoction had no significant influence on the dressing percentage, weights of crop (full), heart, proventriculus (full), intestines (full), feet and head. Decoction however, significantly affected gizzard (both full and empty), crop (empty), liver, kidney and proventriculus (empty). Liver and gizzard weights significantly increased with the inclusion of AID and RVD in water. Apart from WBC and Lymphocytes which were significantly influenced by decoction, the other blood parameters did not show any significant difference. This study suggests that AID and RVD replacement to antibiotics and coccidiostat may have beneficial effects on body weight gain and feed conversion efficiency. Total comparative profit derived from replacing antibiotics + coccidiostat with AID and RVD resulted in economic gains.

Key words: Broiler chickens, *Azadirachta indica*, *Rauvolfia vomitoria*, decoctions

INTRODUCTION

The problem of high feed cost remains the most important constraints to the expansion of commercial livestock production. The need to exploit other available but neglected cheaper novel feed resources, especially those indigenous to our environment and inedible to man is urgently necessary (Okoli *et al*., 2002). Recently the use of Antibiotic Growth Promoters (AGP) in the poultry industry has been seriously criticized because of the development of microbial resistance to these products and the potential harmful effects on human health (Williams and Losa, 2001). On the other hand, there is increasing public and government pressure in several countries to search for natural alternatives to antibiotics (McCartney, 2002). There are a number of compounds and products in nature that have the potential of stimulating growth by virtue of being antibacterial and antifungal. Most of the plant parts such as fruits, seeds, leaves, bark and roots contain compounds with proven antiseptic, antiviral, antipyretic, anti-inflammatory, antiulcer and antifungal uses.

Neem (*Azadirachta indica*) is an indigenous tropical plant predominant in Ghana. *Azadirachta indica* is medicinal and it is used as insecticide and pesticide (Schmutterer and Singh, 1995). The leaf meal has a proximate composition of 92.42 dry matter; 7.58% moisture; 20.68% crude protein; 16.60% crude fibre; 4.13% Ether extract; 7.10% Ash and 43.91% Nitrogen free extract (Ogbuewu, 2008). The cumulative effects of the aqueous leaf extracts of *Rauvolfia vomitoria* on body tissues was studied in rat. A root decoction did not have any adverse effect on the oestrus cycle, fertilization or implantation and did not show foetotoxicity or hormone-induced infertility in a laboratory test with rats. Body weight of both the treated and the control animals increased progressively as the period also increased (Bedu-Addo, 1993). An ethanolic leaf extract of *Rauvolfia vomitoria* showed an improvement in blood sugar levels of normal and alloxan-induced diabetic rabbits (Nwodo *et al*., 2003). It is therefore considered to be non-hazardous.

Corresponding Author: H.K. Zanu, Department of Animal Science Education, University of Education, Winneba, P.O. Box 40, Mampong-Ashanti, Ghana

The objective of this study was therefore to investigate the usefulness of *Rauvolfia vomitoria* (Akakapenpen) and *Azadirachta indica* (Neem) decoction in broilers as a source of natural growth promoter while providing a cost advantage to poultry farmers.

MATERIALS AND METHODS

Study area and duration of the study: The experiment was conducted at the poultry section of the Department of Animal Science, University of Education Winneba, College of Agriculture Education, Mampong-Ashanti. It lasted for 6 weeks (42 days).

Processing and feeding of herbal leaves: A synthetic antibiotic (OTC) and coccidiostat (coccivet) were used in the control group, whereas the other treatments used the leaves of *Rauvolfia vomitoria* (Akakapenpen) and *Azadirachta indica* (Neem) in a herbal decoction (water in which the herbal source was boiled and which therefore contains the constituents of the substance soluble in boiling water). The three experimental diets were prepared and designated as Control, AID (*Azadirachta indica* decoction) and RVD (*Rauvolfia vomitoria* decoction).

The young leaves of the herbal trees used in each treatment group were harvested and the leaves were sun-dried for three days on cement floors until they became crispy while still retaining the greenish colouration. The leaves were turned regularly to prevent uneven drying and possible decay of leaves. They were washed and then boiled with gas stove for 20 min (40 g of chopped leaves in 9L of water). The decoctions were placed in separate sterilized bottles ready for use.

Experimental birds and design: One hundred and eighty, two-week old commercial strain of broiler chickens (Cobb broilers) procured from Darko Farm in Kumasi were used in the study. These birds were randomly distributed to the treatments with twenty birds per replicate, with each treatment replicated three times in a Completely Randomized Design (CRD). Data was collected on weight gain, feed intake, feed conversion efficiency and economy of gain. Hematological test-Packed Cell Volume (PCV), Hemoglobin (Hb), White Blood Cell (WBC), Red Blood Cell (RBC), Mean Corpuscular Volume (MCV) and Mean Corpuscular Hemoglobin Concentration (MCHC), Mean Corpuscular hemoglobin (MCH) and Lymphocytes (LYM) were carried out. Blood samples (1.5 ml each) were drawn from the wing veins of two randomly selected birds from each replicate into EDTA-containing vacutainer tubes and immediately analyzed.

Two birds from each replicate were randomly selected and deprived of feed but not water for 14 h. They were slaughtered and eviscerated for organ weight determination. The effects of decoctions on the parameters measured were statistically analyzed. Differences between means were determined by the use of the Duncan's Multiple Range Test (Steel *et al*., 1997). The computations were performed using the general linear models procedures of the Statistical Analysis System Institute Inc (1999).

Management: The experimental broilers were given *ad-libitum* feeding and watering. Checking and filling of the feeding troughs were done twice a day. To ensure proper health and sanitation, cleanliness was practiced at all times. Vaccination through water was the same for each treatment group.

RESULTS AND DISCUSSION

The results of the effects of Control, AID and RVD on broiler performance are shown in Table 1.

The results of the present study indicated that AID and RVD administration to broilers may have a beneficial effect ($p<0.05$) on body weight gain and feed conversion efficiency (Table 1) though RVD may decrease feed intake. Nonetheless, the lower feed intake did not affect FCE as birds offered this treatment recorded the best weight gain. These results on AID are similar to the results obtained by Abu-Dieyeh and Abu-Darwish (2008) in broiler studies. Again, these results are in agreement with reports that, the use of various plant materials as dietary supplements, including herbs or extract, may positively affect poultry productivity and subsequent production performance (Lee *et al*., 2003). The results with respect to feed efficiency agree with other work that phytogenic additives may stimulate digestibility, which can in turn improve feed efficiency (Lee *et al*., 2003). The FCR recorded were within the range of 2.2 and 0.46 respectively, as reported by Awaad and Zouelfeker (2001). The mortality recorded did not exhibit significant difference between Control, AID and RVD. The overall health of dietary AID and RVD-treated birds appeared to be excellent, which was shown by the relative weights of major organs remaining stable. The post-mortem of two dead birds on RVD revealed clotted blood in the heart. The side effects of the medication of RVD which has large number of alkaloids include respiratory depression, slowed heartbeat, hypotension and gastro-intestinal distress (Dasi, 2004). The cause of clotted blood in the heart may be as a result of an overdose of alkaloid to the birds.

Table 2 shows the results of treatments on carcass and organ weights of broiler chickens. Dressing percentages of the birds fed AID and RVD were not significantly different ($p>0.05$), from those on the control. The result for the body weight gain across treatment groups showed that administration of RVD resulted in increase ($p<0.05$) in weight gain from 1.92-2.00. There was slight increase in the dressing percentage when AID was used (Table 2). Esonu *et al*. (2006) in an

Table 1: Effect of Experimental Treatment on the Performance of Broilers

Variable	Control	AID	RVD	SEM
Mean Initial Body Weight (g)	261.90	266.40	264.17	0.16
Mean Final Body Weight (g)	2404.44	2241.59	2324.87	95.23
Mean Total Body Weight Gain (g)	2142.90	1975.40	2060.70	95.26
Mean Daily Weight Gain	51.21	47.03	49.06	2.09
Mean Feed Intake (g/day)	111.77[a]	109.55[a]	106.00[b]	1.70*
Mean Water Intake (ml)	314.71	319.81	316.34	5.67
FCE (Feed/Gain)	2.18	2.33	2.16	0.06
Mortality (%)	0.00	1.7	6.7	4.05

Table 2: Effect of treatment on carcass characteristics

Variable (g)	Control	AID	RVD	SEM
Dressed weight	1983.78	2083.40	2012.36	43.05
Dressing percentage	83.78	87.40	82.14	2.25
Wt. of full Gizzard	61.57[a]	74.31[b]	71.78[c]	3.10
Wt. of empty Gizzard	41.19[a]	48.10[b]	48.30[b]	1.31
Weight of full crop	11.86	11.86	11.88	0.01
Weight of empty crop	11.01[a]	11.03[a]	11.88[b]	0.01
Wt. of liver	47.33[a]	59.63[b]	69.83[c]	0.90
Wt of heart	12.74	12.04	12.35	0.96
Wt. of full proventriculus	17.44	16.43	17.80	0.48
Wt. of empty proventriculus	16.58[a]	15.50[b]	15.50	0.99
Weight of kidney	6.01[a]	6.01[a]	6.70[b]	0.00
Wt. of full intestines	1.61	1.61	1.62	0.01
Wt. of empty intestines	1.11	1.11	1.13	0.01
Wt of feet	101.92	101.97	97.40	11.63
Weight of head	65.36	65.77	60.74	2.50

[abc]Means within the same row having different superscripts are significantly different at ($p<0.05$). SEM = Standard Error Mean

experiment on layers also recorded the highest dressing percentage from layers who received 5% and 10% Neem Leaf Meal (NLM) diets. This means that neem leave may contain some growth promoters that enhance dressing percentage. Decoction had no significant influence on the weights of crop (full), heart, proventriculus (full), intestines (full), feet and head. Decoction however, significantly ($p<0.05$) affected gizzard (both full and empty), crop (empty), liver, kidney and proventriculus (empty). Liver and gizzard weight significantly increased with the inclusion of AID and RVD in water. The percentage weights of the liver and gizzard obtained with inclusion of AID and RVD was in agreement with work by Esonu *et al*. (2006) on layers who recorded the highest liver and gizzard weight at 5% dietary levels of NLM.

The haematological parameters were not significantly ($p>0.05$) different between treatments except for the WBC and lymphocytes, however, the values obtained were in harmony with the normal range for healthy birds as stated by Awaad and Zouelfeker (2001); Aiello and Mays (1998) and Campbell *et al*. (2003). The White Blood Cell (WBC) and lymphocytes of birds in the RVD treatment group differed significantly from those of AID treatment group, but similar to the WBC and lymphocytes of the control (0%). Birds on RVD recorded the highest hemoglobin value of 10.73 g/dL, but this was not significantly different from those on Control and AID.

Table 3: Effect of AID and RVD on haematological values of broiler chickens

Variable	Control	AID	RVD	SEM
WBC ($x10^6/mm^3$)	9.60[a]	7.80[b]	9.10[a]	0.30
LYM (%)	79.73[a]	67.87[b]	75.40[a]	1.88
RBC (million/µL)	2.31	2.23	2.52	0.23
HBG (g/dl)	9.90	7.90	10.73	2.39
HCT (%)	27.73	28.17	30.57	1.05
MCV (fl)	120.27	120.00	121.47	4.00
MCH (pg/cell)	42.97	42.97	40.17	2.00
MCHC (g/dl)	35.70	36.13	35.17	1.22

[abc]Means within the same row having different superscripts are significantly different at ($p<0.05$). SEM = Standard Error Mean

Table 4: Costs and benefits from offering the different treatments

Variable	Control	AID	RVD
Decoction/Drug cost/g (GH∝)	0.03	0.01	0.01
Decoction/Drug intake (g/bird)	1.00	30.00	30.00
TCOD/DPB (GH∝)	0.03	0.27	0.27
Dress wt. (kg)	2.00	2.06	2.02
Price per dress wt/kg (GH∝)	6.00	6.00	6.00
Value of bird (GH∝)	12.00	12.37	12.14
Net revenue/bird (GH∝)	11.97	12.10	11.87

TCOD/DPB = Total Cost of Decoction/Drug per Bird (GH∝)

There was a reduction in the circulating WBC among birds placed on AID. The lymphocyte value of birds on AID again was low. This may have caused the observed leucopenia, since lymphocyte numbers account for almost half of the WBC population. The decreased

lymphocyte numbers here may be due to effect of nutrient imbalance and/or nutrient utilization. The lower values of WBC in birds whose treatment was AID implied that these birds were not better immunized against infections (pathogens) than those on the other treatments (Terry, 2009).

Cost benefit analysis: Total comparative profit derived from replacing antibiotics and coccidiostat with AID and RVD resulted in economic gains. The cost per gram of both treatments AID and RVD were lower than the control. This result therefore is of considerable interest to poultry producers in areas of the world where natural alternative antibiotics abound but are currently under-utilized. There was a 1% savings when AID replaced antibiotics and coccidiostat. The use of RVD however resulted in negligible decrease (0.8%) in net revenue compared to control.

Conclusion and recommendation: This study suggests that AID and RVD replacement to antibiotics and coccidiostat may have beneficial effects on body weight gain and feed conversion efficiency. Based on the findings from this study, it can be concluded that herbal leaves as a source of antibiotics for broilers are as good as commercial antibiotics. Although this study will help poultry nutritionist and sector, further studies are needed to elucidate the effects of AID and RVD on meat quality and microflora population in caecum.

REFERENCES

Abu-Dieyeh, Z.H.M. and M.S. and Abu-Darwish, 2008. Effect of feeding powdered black cumin seeds (*Nigella sativa* L.) on growth performance of 4-8 week old broilers. J. Anim. Vet. Adv., 3: 286-290.

Aiello, S.E. and A. Mays, 1998. The Mercks Veterinary Manual. 8th Edn., Merck and Co. Inc; Whitehouse station, N.J., pp: 8.

Awaad, A.M.A. and S.S.A. Zouelfeker, 2001. Project: Effects of Probiotics and Combination of *E. coli* Infections in Broiler Chickens. Cairo University, Faculty of Veterinary Medicine, Department of Poultry Diseases, Giza, Egypt, pp: 18-20.

Bedu-Addo, K., 1993. Effect of the Crude Extract of the Root of *Rauwolfia vomitoria* on the Reproduction of Female Albino Rats (*Rattus norvegicus*). M.Phil. Degree Thesis, Department of Biological Sciences, Faculty of Science, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana, pp: 100.

Campbell, J.R., M.D. Kenealy and K.L. Campbell, 2003. Anatomy and Physiology of Farm Animals. In: Animal Sciences. The biology, care and production of domestic Animals. 4th Edn., McGraw Hill Company Inc. New York, pp: 179-202.

Dasi, K.A., 2004. Chromatographic (TLC) analysis of alkaloids of Rauvolfia vomitoria. B. Pharm. degree thesis, Department of Pharmaceutical Chemistry, Faculty of Pharmacy, K.N.U.S.T., Kumasi, Ghana, 57 pp.

Esonu, B.O., M.N. Opara, I.C. Okoli, H.O. Obikaonu, C. Udedibie and O.O.M. Iheshiulor, 2006. Physiological responses of laying birds to Neem (*Azadirachta indica*) leaf meal based diets, body weight, organ characteristics and hematology. Online J. Health Allied Sci., 2: 4.

Lee, K.W., H. Everts, H.J. Kappert, M. Frehner, R. Losa and A.C. Beynen, 2003. Effects of dietary essential oil components on growth performance, digestive enzymes and lipid metabolism in female broiler chickens. Br. Poult. Sci., 44: 450-457.

McCartney, E., 2002. The natural empire strikes back. Poult. Int., 41: 36-42.

Nwodo, N.J., G.B. Okide, J.M. Okonta and I.M. Ebebe, 2003. Antidiabetic effect of *Rauwolfia vomitoria* ethanolic leaf extract in rabbits. J. Trop. Med. Plants, 4: 71-74.

Ogbuewu, I.P., 2008. Physiological responses of rabbits fed graded levels of neem (*Azadirachta indica*) leaf meal. M.Sc. Thesis, Federal University of Technology, Owerri, pp: 51.

Okoli, I.C., G.C. Okoli and C.S. Ebere, 2002. Indigenous livestock production paradigms revisited. Survey of plants of Ethnoveterinary importance in South Eastern Nigeria. Trop. Ecol., 43: 257-263.

Schmutterer, H. and R.P. Singh, 1995. List of Insects Susceptible to Neem Products. In: The Neem Tree Sources of Unique Natural Products for Integrated Pest Management, Medicine, Industry and Other Purposes, Schmutterer, H. (Ed.). VCH, Publishers, New York, pp: 87.

Statistical Analysis Systems Institute Inc., 1999. SAS/STAT: User Guide Version and for window. SAS Institute Inc. Cary-NC. USA.

Steel, R.G.D., J.H. Torrie and D.A. Dickey, 1997. Principles and Procedures of Statistics. A Biometrical Approach. 3rd Edn., McGraw-Hill, New York.

Terry, B., 2009. Thymic Protein A. http://www.anapsid.org/cnd/drugs/beardsley1.html. Accessed on 17th May, 2011.

Williams, P. and R. Losa, 2001. The use of essential oils and their compounds in poultry nutrition. World Poult. Elsevier, 17: 14-15.