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EFFECT OF REPLACING VACCINES WITH HOT PEPPER ON THE GROWTH PERFORMANCE OF BROILER CHICKENS

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This experiment was conducted with one hundred and fifty (150) day old (Marshal) broiler chicks which were allotted to five treatments of three replicates each in a completely randomized design (CRD). The study which lasted eight weeks was undertaken to find out the comparative advantages of Avenir (*Capsicum chinense*), black pepper (*Pepper nigrum*), *Capsicum annum*, and Cayenne longslim (*Capsicum baccatum)* and tagged T_2, T_3, T_4 and T_5 respectively as replacements for Gumboro (IBD) and Lasota vaccines in broiler chickens. They were added to the diets at inclusion level of 20g per kilogram of compounded diets. Birds fed with *Capsicum annum* (T_4) had the higher final weight and lesser mortality (2240g, 13.33%) compared to treatment one (Control) with final weight and mortality of 1769g and 16.67%, respectively. There were no significant ($P>0.05$) differences in the feed intake, body weight gain and feed conversion ratio among the treatments. However, there were higher body weight gain and lower mortality rate in birds fed *Capsicum annum* (T_4) compared to other treatments. In conclusion, using hot pepper, especially *Capsicum annum*, as replacement for vaccines in broiler production had no adverse effects on the growth performance of the birds.

Keywords: broiler chickens, hot pepper, performance

In Nigeria, poultry meat is among the sources of animal protein, making important contribution to human diet and economic improvement. According to Alabi and Osifo (2004), poultry sector represents more than 57% of total livestock production in Nigeria and, Ofouk and Aijeh (2005) reported that many are into poultry production for either the meat or egg.

As many people are breaking from the intake of meat and dairy products, because of chemicals ingested by livestock and poultry birds especially in the area of vaccines, it is very important to search for alternative sources of vaccine for the animals. According to Khachatourians (1998), many countries have currently banned the use of drugs including antibiotics as growth promoters due to side effect on animals and human. Attempts have arisen therefore, in search of alternatives to drugs and vaccines in animal production practices, especially use of additives of plant origin which are natural and safe to consumers (Soliman *et al.*, 2003).

Vaccines and drugs are being used in conventional poultry production. In fact, they are allowed in organic poultry production to prevent diseases. However, with the use of the vaccines many poultry farmers still encountered great losses. In Nigeria, many vaccines are already dead before reaching farmers either due to storage or transportation from the point of purchase to the farm. Also of importance is that costs of vaccines add to already high cost of poultry production. Therefore, if we are to do away with vaccines and invariably reduce cost of production then, the use of natural treatment is of necessity.

In recent times, the use of antibiotics in poultry production has become undesirable due to the meat product residuals (Burgat, 1999), and development of antibiotics resistant bacteria population in human (Sahim *et al*., 2002). To improve performance in production therefore, supplementation of natural components in place of vaccines in poultry production is to be considered.

Al-Kassie and Witwit, (2010) reported that piperine an active component of black

pepper enhances the thermogenesis of liquids and accelerates energy metabolism in the body and also increases the serotonin and beta-endorphim production in the brain. It is also found that pepper has antioxidant properties and anti-carcinogenic effect (Surh and Lee, 1995). Among its chemical and biological activities, piperine is said to be characterized by antimicrobial and anti-inflammatory properties. *Capsicum* species can either be used fresh or dried, whole or ground, but the level of hotness of the *Capsicum* species depends upon the concentration of capsaicin. Capsicum peppers are important food ingredients, and also clearly have nutritional and medicinal properties. Capsicum continues to be a source of vitality and health in numerous countries including the Bahamas and Costa Rica, where it is used to overcome colic or indigestion, in Africa for vascular disorders and by North Americans who use it as a tonic and natural stimulant and Chinese physicians utilized it for physiologic conditions that needed stimulation (Anonymous[a], 1996) as cited by Alaa (2010). Its active compounds are alkaloids, fatty acids volatile oil, rutin (flavonoids), and it is the high flavonoid content which makes it a good antioxidant (Lee *et al*, 1995 and Howard *et al.*, 1994). The red colour of *Capsicum*, as reported by Cordell and Araujo (1993), is due in part to its very high content of vitamin A, and rich in Vitamin C which has a tonic effect with Vitamin A on the immune system, making the body less vulnerable to microorganism invaders. It also contain B-complex vitamins, B1, B2, B3, B5, B6, B9, folic acid and zinc, iron, calcium, potassium, magnesium, cobalt, phosphorus, sulphur, , sodium, selenium, fats (9-17%) and proteins (12-15%). According to Acero-Ortega *et al.* (2005), capsicum also contain phenylpropanoids (L-phenylalanine, tcinnamic acid, o-coumaric acid, mcoumaric acid, ferulic acid, and caffeic acid) which are intermediates of the capsaicinoids pathway. Cordell and Araujo, (1993) reported that the presence of the capsaicin in these species has long been associated with strong analgesic properties, alterations in the pH of gastrointestinal tract epithelial cells, prevention of microbial infection (Tellez *et al.*, 1993). It has also been shown that pepper species also contain peptides with strong antimicrobial activity and that these peptides are encoded in the pepper genome (Texeira *et al.*, 2006 and Diz *et al.*, 2006). Also of significance is that it lowers both blood cholesterol and triglycerides, but even more important is the lowering of the LDL-HDL ratio, the mechanism for this is not understood blood serum cholesterol levels was significantly inhibited (Sambaiah and Satyanarayana, 1980 and Visudhiphan *et al.*, 1982). It was on the above that four different hot peppers were used to replace vaccines in broiler production and compared the mortality rate among the treatments.

MATERIALS AND METHODS

Experimental site

The study was carried out at the Teaching and Research Farm of Ibrahim Badamasi Babangida University, Lapai, Niger State, Nigeria, which is situated between Latitude $9^{o}31$ and $9^{o}45$ East of Equator (Usman, 2013). According to the author, the area falls within the Guinea Savannah Vegetation Zone of Nigeria with mean rainfall ranges between 1100 – 1600mm and mean temperature between 21^{o}C and 36^{o}C.

Sources of experimental ingredients

The test ingredients used (hot pepper species), in this experiment were purchased from Minna Ultra Modern Market, Niger State, sun dried and grinded to powdery form. Maize was obtained in Lapai market, while wheat offal, bone meal, fish meal, groundnut cake, lysine, methionine, limestone and vitamin premix were obtained from Animal Care Shop, Gidan Matasa, Minna, Niger state.

Experimental diets

Chicks in T_1 were fed with none of the test ingredients (control). Those in T_2 were fed with Avenir pepper (*Capsicum chennense*), T_3 fed with Black pepper (*Pepper nigrum*), T_4 fed with Aji blanco crystal pepper (*Capsicum annum*), while those in T_5 with Cayenne long slim pepper (*Capsicum baccatum*), at inclusion level of 20g per one kilogram of compounded feed. These test ingredients were used to replace Gumboro and Lasota vaccines against Infectious

Table 1: Gross composition of experimental starter diet

Ingredients (%)	Treatments				
	T_1	T_2	T_3	T_4	T_5
Maize	50.10	50.10	50.10	50.10	50.10
Groundnut cake	34.00	34.00	34.00	34.00	34.00
Fish meal	3.00	3.00	3.00	3.00	3.00
Wheat meal	8.00	8.00	8.00	8.00	8.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Limestone	1.00	1.00	1.00	1.00	1.00
Table salt	0.25	0.25	0.25	0.25	0.25
*Premix	0.25	0.25	0.25	0.25	0.25
Lysine	0.20	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20	0.20
Avenir	-	+	-	-	-
Black pepper	-	-	+	-	-
Capsicum annuum	-	-	-	+	-
Cayenne *baccatum*	-	-	-	-	+
Total	100.00	100.00	100.00	100.00	100.00
Calculated:					
Crude protein (%)	23.41	23.41	23.41	23.41	23.41
ME (kcal/kg)	2767.27	2767.27	2767.27	2767.27	2767.27

*Flomix Mineral-Vitamin premixes of 0.25kg contains vitamin A 10,00mg, Vitamin D3, 2,000mg, Vitamin B1 500mg, Vitamin B2 5,000mg, Vitamin B6 300mg, Vitamin B12 10,000mg, Pantothenic Acid 10,000mg, Niacin 25,000mg, Folic Acid 1,000mg, Biotin 100,000mcg, Choline 150,000mg, Antioxidant 125,000mg and minerals such as Manganese 10,000mg, Zinc 50,000mg, Cobalt 250mg, Iron 40,000mg, Copper 6,000mg, Iodine 500mg and Selenium 100mg.

- = Absence of pepper, + = Presence of pepper

T_2 = Avenir pepper (*Capsicum chennense*), T_3 = Black pepper (*Pepper nigrum*), T_4 = Aji blanco crystal pepper (*Capsicum annum*), T_5 = Cayenne long slim pepper (*Capsicum baccatum*)

Bursal Disease and Newcastle disease respectively. The diets were formulated in such a way that they contained 23% and 2767.27kcal/kg and, 20% and 2794.61kcal/kg for crude protein and metabolizable energy in starter and finisher diets respectively, as presented in Tables 1 and 2.

Experimental birds and management

One hundred and fifty (150) day old broiler chicks of mixed sexes were used for the experiment at the poultry section of the Teaching and Research Farm, Ibrahim Badamasi Babangida University, Lapai. The chicks were randomly assigned into five dietary treatments in a completely randomized design (CRD). Each treatment was replicated thrice with ten chicks per replicate. The pen was washed, cleaned and disinfected with germicide (Izal) before the commencement of the experiment. Prior to the arrival of the chicks litter materials (wood shavings) were spread on the floor. On arrival, feed and water mixed with anti-stress (glucose) were served immediately and the temperature of the brooding room was under control. Chargeable lamps were used as the source of the lighting and charcoal as source of heat during brooding. Litters were changed fortnightly. Vitalyte® was administered to the birds after every weighing. Feed and water were supplied *ad-libitum*. Feed intake and the body weight of the birds were recorded on weekly basis. Embazin forte® and antibiotics were administered in water and all the vaccines (Lasota and Gumboro) were administered as at when due to birds in treatment 1 (T_1). Oxy-tetracycline and Amprococ, were

administered to the chicks via drinking water for 5 and 3 days respectively.

Data collection

The performance of experimental chicks in terms of feed consumption, weight gain and feed conversion ratio was recorded. Feed intake was carried out on weekly basis. It was calculated as total amount of feed consumed by the birds within the week and it is given as; Feed offered (kg) – left over (kg). The birds were weighed on weekly basis for body weight gain. The initial weight was subtracted from the final weight to get the body weight gain.

Feed conversion ratio: This was done at the end of each week and calculated as:

$$\text{Feed conversion ratio} = \frac{\text{feed consumed (g)}}{\text{weight gained by birds (g)}}$$

Statistical analysis

Data obtained were subjected to analysis of variance (ANOVA) for a completely randomized design (CRD), according to the procedure of Gen Stat (2014) using LSD for all means that were significantly different.

RESULTS AND DISCUSSION

Feed intake, feed conversion ratio and body weight gain of the broilers as influenced by dietary inclusion of dried avenir, black pepper, Aji blanco crystal and cayenne long-slim pepper were p resented in Table 3. There were no significant (P>0.05)

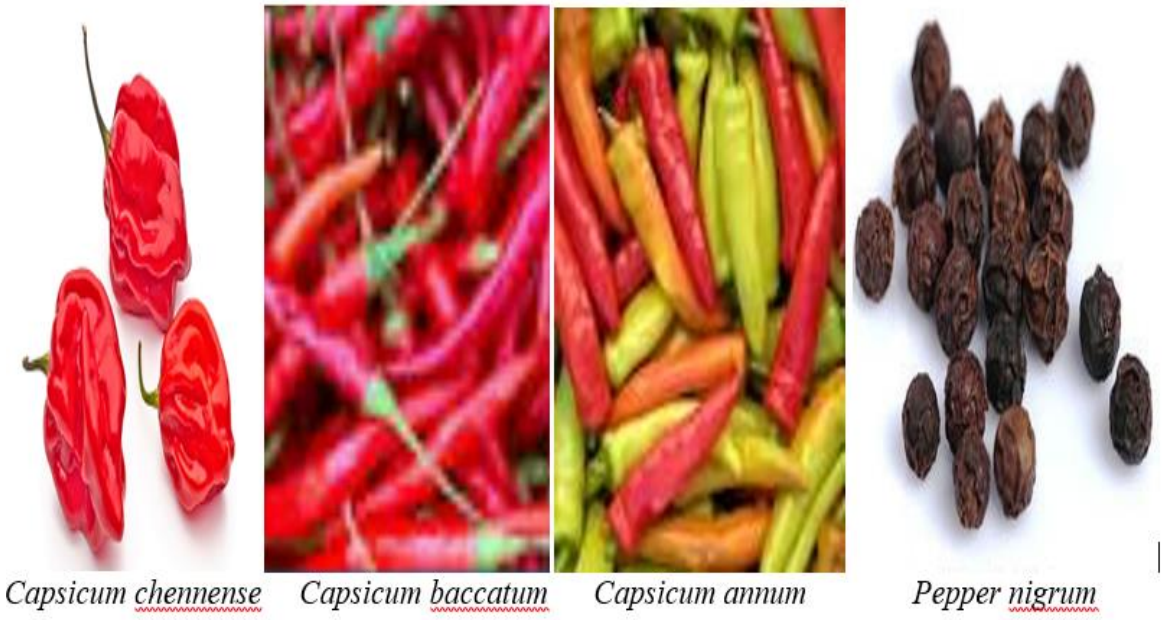
Table 2: Gross composition of experimental finisher diets

Ingredient (%)	Treatment				
	T_1	T_2	T_3	T_4	T_5
Maize	56.40	56.40	56.40	56.40	56.40
Groundnut cake	25.40	25.40	25.40	25.40	25.40
Fish meal	3.00	3.00	3.00	3.00	3.00
Wheat offal	10.3	10.3	10.3	10.3	10.3
Bone meal	3.00	3.00	3.00	3.00	3.00
Limestone	1.00	1.00	1.00	1.00	1.00
Salt	0.25	0.25	0.25	0.25	0.25
*Premix	0.25	0.25	0.25	0.25	0.25
Methionine	0.20	0.20	0.20	0.20	0.20
Lysine	0.20	0.20	0.20	0.20	0.20
Avenir	_	+	_	_	_
Black pepper	_	_	+	_	_
Aji blanco crystal	_	_	_	+	_
Cayenne *baccatum*	_	_	_	_	+
Total	100.00	100.00	100.00	100.00	100.00
CP (%)	20.31	20.31	20.31	20.31	20.31
ME (kcal/kg)	2794.61	2794.61	2794.61	2794.61	2794.61

*****Flomix Mineral-Vitamin premixes of 0.25kg contains vitamin A 10,00mg, Vitamin D3, 2,000mg, Vitamin B1 500mg, Vitamin B2 5,000mg, Vitamin B6 300mg, Vitamin B12 10,000mg, Pantothenic Acid 10,000mg, Niacin 25,000mg, Folic Acid 1,000mg, Biotin 100,000mcg, Choline 150,000mg, Antioxidant 125,000mg and minerals such as Manganese 10,000mg, Zinc 50,000mg, Cobalt 250mg, Iron 40,000mg, Copper 6,000mg, Iodine 500mg and Selenium

– = Absence of pepper,+ = Presence of pepper

T_2 = Avenir pepper (*Capsicum chennense*), T_3 = Black pepper (*Pepper nigrum*), T_4 = Aji blanco crystal pepper (*Capsicum annum*), T_5 = Cayenne long slim pepper (*Capsicum baccatum*)



differences among the treatments. This could be as a result of iso-caloric and iso-nitrogenous diet fed during the experiment. In this study, pepper supplementation had effects on the feed conversion ratio of the broiler chickens. The feed conversion ratios of the birds fed with peppers were better than the one recorded in the control (T_1). These results are similar to the report of Shahverdi *et al*. (2013) that birds fed with addition of hot pepper showed better feed conversion ratio. Alkasie *et al*. (2011) recorded that black pepper influences the absorption power, decrease material transit velocity. This could be the reason for the better final live weight recorded in birds fed black pepper (T_3) than the control.

Consumption of *Capsicum chinense* (Avenir), *Pepper nigrum* (Black pepper), *Capsicum annum* (Aji blanco crystal pepper) and *Capsicum baccatum* (Cayenne long-slim) by the broiler chickens has positive influence on the growth performances of the birds. This is in agreement with the reports of Alaa (2010) and Al-Kassie *et al*. (2011) that the effects of active substances or herbals in animal nutrition may stimulate appetite, feed intake, improvement of endogenous digestive enzyme, secreation, activation of immune response and antibacterial, antiviral, antioxidant and anti-helminthic actions (Janssen, 1989; Manzanilla *et al*., 2001; Jamroz *et al*., 2003). The total and mean parameters of body weight gain from the Table above showed that treatment 4 fed 20g of *Capsicum annum* in 1kg compounded feed had the highest value (280.00), followed by treatment 5 (256.63) fed diets with inclusion of cayenne long slim pepper. Treatment 1 (T_1) had the worst (2.63) feed conversion ratio, followed by treatment 5 (T_5) (2.06), while birds fed

Table 3: Effect of inclusion of pepper in the diet of broiler on growth performance

Parameter	T_1	T_2	T_3	T_4	T_5
Initial live weight (g)	94.00	96.04	90.45	90.15	92.56
Final live weight (g)	1769.00	1910.00	1910.00	2240.00	2053.00
Feed intake	581.25	481.53	492.98	527.63	528.80
Body weight gain	221.13	238.75	241.25	280.00	256.63
Feed conversion ratio	2.63	2.02	2.04	1.88	2.06
Mortality (%)	16.67	20.00	33.33	13.33	23.33

T_1 = Control, T_2 = Avenir pepper (*Capsicum chennense*), T_3 = Black pepper (*Pepper nigrum*), T_4 = Aji blanco crystal pepper (*Capsicum annum*), T_5 = Cayenne long slim pepper (*Capsicum baccatum*)

treatment 4 (*Capsicum annum*) had the best feed conversion ratio (1.88) among others. Birds fed black pepper (T_3) and Cayenne long-slim (T_5) had the highest percentage mortality 33.33% and 23.33% respectively, while birds fed *Capsicum annum* (treatment 4) recorded the least (13.33%) mortality. This is in agreement with the reports of Anonymous[a] (1996) as cited by Alaa (2010), and Cordell and Araujo (1993) that the red colour of Capsicum is rich in vitamins A and C which has a tonic effect on the immune system, making the body less vulnerable to microorganism invaders. The data from feed consumed, feed conversion ratio and body weight gain (Table 3) showed that there were no significant ($P>0.05$) differences among the treatments. The lowest body weight gain exhibited by broiler chickens fed with *Piper nigrum* showed that its inclusion in broilers diets were not favourable.

CONCLUSION

In conclusion, broiler birds in T_4 fed *Capsicum annum* had the higher performance in term of body weight gain and less mortality than the control (T_1). Therefore, the dietary inclusion of *Capsicum annum* may be used as natural replacement for vaccines in broiler production.

REFERENCES

1. Acero-Ortega**,** C. L. Dorantes-Alvarez**,** H. Hernández-Sánchez, G. Gutiérrez-López**,** G. Aparicio**,** M. E. Jaramillo-Flores, 2005. Evaluation of Phenylpropanoids in Ten Capsicum annuum L. Varieties and Their Inhibitory Effects on Listeria monocytogenes Murray, Webb and Swann Scott A. Food Science and Technology International, (11)1: 5-10
2. Alaa, A.A. (2010). The effect of the Capsicum annum in the diet of broilers on the isolation and shedding rate of Salmonella paratyphoid. Kufa Journal for Veterinary Medical Sciences, 1(1): 28 – 38.
3. Alabi, R.A and Osifo, A.A (2004), Constituents to self sufficiency in backyard poultry in Edo State. Proceeding of 9th Annual Conference of Animal Science Student Association of Nigeria, September 13th – 16th (2004), Ebonyi state University, Nigeria. Page 177 – 180.
4. Al-Kassie, G.A.M. and Witwit, N.M. (2010). A comparative study on diet supplementation with a mixture of herbal plants and dandelion as a source of prebiotics on the performance of broilers. Pakistan J. Nutrition, 9(1): 67-71.
5. Al-Kassie, G.A.M., Mamdooh, A.M., Al-Nasraw, S. and Ajeena J (2011). Use of black pepper (Piper nigrum) as feed additive in broiler diet. Research Opinions in Animal and Veterinary Science, 1(3): 169-173.
6. Anonymousa , (1996). Capsicum Therapeutic Powerhouse and Herbal Catalyst, a book of
7. Woodland Publishing, Inc. P.O. Box 160 Pleasant Grove, UT 84062 Anonymusb, (2005). Capsicum information, drug interaction, uses and benefits. http:/www.Ayurvedic-Medicines.org.
8. Burgat V (1999). Residues of drugs of veterinary use in food. Rev. Part., 41: 985-990.
9. Cordell, G.A. and O.E. Araujo (1993). Capsaicin: Identification, nomenclature, and pharmacotherapy. Ann. Pharmacother. 27: 330-336.
10. Diz, M.S.S., A.O. Ccarvalho, R. Rodriguez, A.G.C. Neves-Ferreira, M.D. Cunha, (2006). Antimicrobial peptides from chili pepper seeds causes yeast plasma membrane permeabilization and inhibits the acidification of the medium by yeast cells. Biochem. Biophys. Acta, 1760:1323-1332.

11. Gen Start Release 14.3DE (2014). VSN International ltd. (Rothamsted Experiment Station).
12. Howard, L.R., R. T. Smith, A. B. Wagner, B. Villalon, E. E. Burns, (1994). Provitamin A and ascorbic acid content of fresh peppercultivars (Capsicum annuum) and processed jalapeños. Journal of Food Science, 59: (2): 362-365.
13. Jamroz, D., Orda, J., Kamel, C., Williczkiewicz, A., Wertelecki, T and Skorupinska, J. (2003). The influence of phytogenic extract on performance, nutrients digestibility, carcass characteristics and gut microbial Status in broiler chickens. J. Anim. Feed Sci., 12(3): 583 – 596.
14. Janssen, A.M. (1989). Antimicrobial Activities of Essential Oils: A Pharmacognostical Study. Dissertation, Rijksuniversiteit Leiden.
15. Khachatourian, G.G. (1998). Agricultural use of antibiotic and the evolution and transfer of antibiotic resistant bacteria. Canadian Medical Association Journal. 159:1129 – 1136.
16. Lee,Y., L.R. Howard, and B. Villalon, (1995). Flavonoids and antioxidant activity of fresh pepper (*Capsicum annuum*) cultivars. Journal of Food Science. 60 (3): 473-476.
17. Manzanilla, E.G., Baucells, F., Kamel, C., Morales, J., Perez, J., F and Gasa, J. (2001). Effects of plant extracts on the performance and lower gut microflora of early weaned piglets. *J. Anim. Sci.*, Suppl., 1: 473. (Abstract).
18. Ofouk, A.U. and P.C. Aijeh (2005). Sources of information on animal health management among Poultry farmers in Delta State Nigeria. Production 10th annual conference Animal Science Association of Nigeria. (ASAN), 322 – 324.
19. Sambaiah, K. and N. Satyanarayana. (1980). Hypocholesterolemic effect of red pepper

