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Faecal Bio-Physical Parameters of Two Strains of Laying Chickens Fed Dietary Supplementation of Acetylsalicylic Acid

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Abstract

The experiment was performed to compare the faecal bio-physical parameters of two strains of laying birds fed different levels of dietary Acetylsalicylic acid (ASA), using total faecal output, faecal dry matter, faecal volume, faecal density, faecal output per bird, percentage dry matter output per bird, faecal consistency and faecal moisture content as response criteria. Four experimental diets (control diet and three different ASA diets) designated as: T1(control Diet with 0.00% ASA), T2 (Diet with 0.025% ASA), T3 (Diet with 0.050%ASA), and T4 (Diet with 0.075% ASA) were fed to Isa Brown (IB) and Harco Black (HB) layers. Data on faecal samples were collected a week to the termination of the-sixteen week trial to ascertain the effect of varying dietary levels of ASA on the faecal bio-physical parameters of the birds. The result showed that the faecal volume, faecal weight and the faecal density were significantly different ($p < 0.05$) between breeds, among dietary treatments and in the interaction between breeds and treatments. The HB breed had higher average fresh faecal weight, total dry matter output and average dry matter output but lower faecal matter and faecal consistency than the IB breed. Also, average fresh faecal matter output/day and average dry matter output/day decreased significantly in the ASA diets relative to the control. Birds that consumed the T4 diet had the lowest dry matter faecal output among treatments and in the interaction between breeds and treatments while faecal consistency was improved in both breeds with the supplementation of ASA in the diets. The HB breed had higher faecal volume and hence a less dense faecal matter than the IB breed but faecal density increased in the ASA diets when compared with the control. Faecal volume was decreased in the two breeds of layers while faecal density was increased with the administration of ASA in the diets. In conclusion, this experiment showed that dietary supplementation of ASA at 0.075% can reduce the faecal output, improve faecal consistency, decrease faecal moisture and reduce total dry matter output/bird and can thus play a great role at mitigating the production and emission of greenhouse gases.

Keywords: Aspirin, biophysics, faecal density, faecal consistency, Isa Brown, Harco Black.

Introduction.

More than 50 billions of poultry birds are raised under intensive production each year. This statistic shows that the poultry industry commands a sizable chunk of the world meat and egg trade. With this large population of birds comes a huge deposit of faecal matter that is discharged into the environment with untoward consequences on the biosphere. This has generated a lot of heated debates and complaints against the livestock industry (Millner, 2009) as the major culprit in the generation greenhouse gases that has contributed to oxone layer depletion and global warming.

Many intervention strategies have been employed to combat the menace of poultry manure generated as a result of intensive and large scale production of poultry products. Such strategies include the use of microbial products to lower ammonia levels leading to reduction in mortality and improvement in weight gain, dietary manipulation (Meda *et al*., 2011), the use of titanium dioxide paint (Costa *et al.,* 2012) and the use of vaccine to reduce the activity of enteric methanogenic micro-organisms (Sejian *et al*., 2010).

Acetylsalicylic acid (ASA) orAspirin is a popular anti-pyretic drug whose administration has been extended to livestock especially those raised in the tropics to help combat the problem of heat stress that livestock are exposed to. It has been used as a tranquillizing drug to help birds subjected to heat stress.There is however dearth of information on the effect of ASA administration in poultry on faecal bio-physical parameters like faecal volume, consistency, density and output. All these are faecal factors that can directly impact on the generation of greenhouse gases from poultry litter and its capacity to contribute to global warming.

This experiment was therefore conducted to investigate the effect of dietary supplementation of ASA on the faecal parameters of two strains of commercial layers.

Materials and Methods

Location of Experimental Site: This experiment was carried out at the Student Project Building of the Livestock Section of Teaching and Research Farm of the Federal University of Technology Akure, Ondo State, Nigeria.

Experimental Materials: Two hundred birds comprising 100 Harco Black and 100 Isa Brown pullets were used for the experiment. Four experimental diets were formulated in which ASA was supplemented at 0.00%, 0.025%, 0.050%, and 0.075% of the diet respectively. The 0.00% diet (T1) served as the control while the other three diets were assigned T2, T3, and T4 respectively. Each treatment consisted of four replicates which included the two breeds of birds (12birds per replicate and 48birds per treatment). The experiment was carried out over a period of 16 weeks. The hens were fed with the experimental diets according to their respective treatments until the end of the experiment. All experimental data were recorded till the termination of the experiment. Table 1 gives the composition of the experimental diets.

Table 1: Gross composition (g/100 g) of the experimental diets.

Ingredients	T1	T2	T3	T4
Maize	45.00	45.00	45.00	45.00
Soybean meal	12.00	12.00	12.00	12.00
Wheat offal	22.00	22.00	22.00	22.00
Palm kernel cake	3.50	3.50	3.50	3.50
Groundnut cake	6.50	6.50	6.50	6.50
Fish meal	1.00	1.00	1.00	1.00
Bone meal	2.60	2.60	2.60	2.60
Limestone	6.50	6.50	6.50	6.50
Methionine	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10
Layers premix	0.25	0.25	0.25	0.25
Salt	0.30	0.30	0.30	0.30
Total	100.00	100.00	100.00	100.00
ASA	0.00	0.025	0.050	0.075

T1 = Diets with 0.00% ASA; T2 = Diets with 0.025% ASA; T3 =Diets with 0.050% ASA; T4 =Diets with 0.075% ASA; ASA = Acetylsalicylic acid.

Faecal collection: At the fifteenth week of the experiment, faecal samples were collected from each treatment for three days to determine the faecal output, density, volume, dry matter, consistency and moisture content.A sizeable polythene nylon was spread under the battery cage of each replicate and the faecal samples were collected over twenty four hours (24 hrs) after which the faecal output was determined by weighing the sample on a weighing balance. On the third day, 50 g of faecal sample was collected from each replicate to determine the faecal density using Archimedes principle.Another 100g of the faecal sample was taken from each replicate and taken to the laboratory to determine the moisture content of the faecal sample.

Determination of faecal consistency: This was determined by the observation of the faecal matter of each replicate in each treatment for three days and faecal consistency was determined with the aid of “The WALTHAM Faecal Scoring System”.

Statistical Analysis: Data collected were analyzed using 2x4 factorial design. Statistical Analysis System software package was used to analyze the data while mean separation wherever appropriate was done with the Duncan’s multiple range test (DMRT) of the same statistical package. Significance was accepted at 5% level ($p<0.05$).

Results and Discussion

Table 2 shows the faecal characteristics of the two breeds of commercial laying chickens fed dietary supplementation of ASA. Significant breed differences were observed between Isa Brown (IB) and Harco Black (HB) layers in all the parameters investigated. The HB breed produced more faecal wastes and faecal moisture than the IB breed. More faecal moisture couple with high ambient temperature will predispose the litter to rapid rate of decomposition and maximum production and emission of the greenhouse gases.

The higher the faecal output, the greater the propensity of producing these noxious gases. Rearing breeds with lower tendency to accumulate faecal wastes could therefore serve as a strategy to mitigate the emission of greenhouse gases in animal agriculture. This genetic approach to solving animal waste problems was canvassed by Eckard *et al.* (2010). The supplementation of ASA in the diets decreased the average faecal output and average dry matter output meaning that significant reduction in the amount of faecal waste produced can be achieved by such dietary interventions (Garnett, 2007) such as incorporating ASA in the feed as used in the current study.

Table 2: Faecal Characteristics Two Breeds of Laying Birds fed with different levels of dietary supplementation of Acetylsalicylic acid (ASA)

Treatments	Breeds	TFFW/day(g)	AFFW/day(g)	% FM	% FDM	TDMO (g)	ADMO (g)	FC
	IB	889.45^{b}	108.89^{b}	68.80^{b}	31.19^{a}	275.07^{b}	33.33^{b}	2.50^{b}
	HB	945.57^{a}	117.61^{a}	70.06^{a}	29.94^{b}	283.05^{a}	35.12^{a}	2.60^{a}
	±SEM	55.35	4.64	0.77	0.77	16.56	1.51	0.10
Treatments								
1		1006.20^{b}	130.92^{a}	69.50^{a}	30.50^{b}	302.73^{a}	39.95^{a}	2.63^{a}
2		831.16^{c}	111.14^{b}	70.00^{a}	30.00^{b}	248.80^{b}	33.26^{b}	2.42^{b}
3		1017.90^{a}	103.26^{c}	67.75^{b}	32.25^{a}	323.65^{a}	32.98^{b}	2.42^{b}
4		814.81^{c}	107.67^{c}	70.50^{a}	29.50^{b}	241.05^{b}	30.71^{c}	2.62^{a}
	±SEM	70.08	5.64	1.01	1.01	17.95	1.62	0.13
Breeds x Treatments								
T1 x IB		1057.90^{a}	137.37^{a}	70.50^{a}	29.50^{c}	308.92^{a}	40.73^{a}	2.80^{a}
T1 x HB		954.54^{b}	124.46^{b}	68.50^{b}	31.50^{a}	296.55^{b}	39.16^{a}	2.50^{b}
T2 x IB		830.95^{c}	103.78^{c}	69.50^{b}	30.50^{b}	253.41^{c}	31.64^{d}	2.50^{b}
T2 x HB		831.37^{c}	118.50^{b}	70.50^{a}	29.50^{c}	244.19^{c}	34.88^{b}	2.40^{c}
T3 x IB		915.80^{b}	98.53^{d}	67.00^{c}	33.00^{a}	297.82^{b}	32.14^{cd}	2.40^{c}
T3 x HB		1120.00^{a}	108.00^{c}	68.50^{b}	31.50^{a}	349.49^{a}	33.82^{c}	2.34^{d}
T4 x IB		753.18^{d}	95.88^{d}	68.25^{c}	31.75^{a}	240.13^{c}	28.80^{d}	2.50^{b}
T4 x HB		876.43^{c}	119.47^{b}	72.75^{a}	27.35^{d}	241.98^{c}	32.63^{c}	2.42^{c}
	±SEM	100.67	6.93	1.35	1.36	25.86	2.23	0.11
Breeds		*	*	*	*	*	*	*
Treatments		*	*	*	*	*	*	*
Breeds x Treatments		*	*	*	*	*	*	*

^{a,b,c,cd,d} = Means in the column but with different superscripts are statistically (P<0.05) significant.
TFFW = total fresh faecal weight; AFFW = average fresh faecal weight; FM = faecal moisture; FDM = faecal dry matter; TDMO = total dry matter output; ADMO/bird = average dry matter output/bird; FC = faecal consistency; IB= Isa Brown; HB = Harco Black; T1 = diet with 0.00% ASA; T2 = diet with 0.025% ASA; T3 = diet with 0.050% ASA; T4 = diet with 0.075 ASA.

Table 3 shows the comparison between faecal volume and density in Isa Brown and Harco Black layers fed dietary supplementation of ASA. Results on faecal volume and density revealed that the HB breed had higher faecal volume but lower faecal density than the IB breed. Higher volume translates to a more loosely formed and hence a more watery droppings. Also, there was a tendentious decrease in faecal volume with a corresponding decrease in faecal density as a result of ASA supplementation in the diets. Any such intervention strategy that could decrease faecal moisture, faecal volume and total faecal output could effectively reduce the generation and emission of greenhouse gases and hence curtail global warming and the ill effects of climate change

Conclusion and recommendations

The HB breed produced more faecal moisture, more faecal volume and more faecal output than the IB breed. Dietary supplementation of the layers' feed with ASA decreased faecal volume, increased faecal density and faecal consistency. The use of IB as the layer of choice in intensive egg production venture would therefore be more beneficial to the environment in terms of the curtailment of the emission of greenhouse gases. Also the inclusion of ASA in layers diets would equally tackle the problems associated with climate change through the reduction in faecal moisture, faecal volume and faecal output which are all inherent faecal causes of the increase in the generation and emission of greenhouse gases.

Table 3: Comparison between faecal volume and density in Isa Brown and Harco Black layers fed dietary supplementation of Acetylsalicylic acid (ASA)

Treatments	Breeds	Faecal weight(g)	Faecal volume (ml)	Faecal density (g/m)
	Harco Black	50.00±0.00	52.53±2.83[a]	0.97±0.05[c]
	Isa Brown	50.00±0.00	40.06±2.52[b]	1.28±0.08[a]
T1		50.00±0.00	51.88±4.33[a]	0.98±0.07[c]
T2		50.00±0.00	41.30±5.68[b]	1.28±0.17[a]
T3		50.00±0.00	46.25±6.35[b]	1.14±0.14[b]
T4		50.00±0.00	45.75± 2.84[b]	1.11±0.08[b]
Treatment x breeds				
T1X	Harco Black	50.00±0.00	57.25±7.25[a]	0.89±0.11[d]
T1X	Isa Brown	50.00±0.00	46.50±1.50[b]	1.08±0.04[c]
T2X	Harco Black	50.00±0.00	50.85±3.35[a]	0.98±0.06[c]
T2X	Isa Brown	50.00±0.00	31.75±0.25[d]	1.58±0.02[a]
T3X	Harco Brown	50.00±0.00	54.50±10.00[a]	0.95±0.17[d]
T3X	Isa Black	50.00±0.00	38.00±3.00[c]	1.33±0.11[b]
T4X	Harco Black	50.00±0.00	47.50±2.50[b]	1.01±0.06[c]
T4X	Isa brown	50.00±0.00	44.00±6.00[c]	1.16±0.16[c]
	Breeds	NS	*	*
	Treatments	NS	*	*
	B x T	NS	*	*

[a,b,c,d]=Means in the same column but with different superscripts are statistically ($p<0.05$) significant.
T1 = diets with 0.00% ASA; T2 = diets with 0.025% ASA; T3 diets with 0.050% ASA; T4 diets with 0.075 ASA; NS = Not significant; B x T = Breed x Treatment.

References

Costa, A., Chiarello, G.L., Selli, E. and Guarino, M. (2012). Effects of TiO_2 based photocatalytic paint on concentrations and emissions of pollutants and on animal performance in a swine weaning unit. *J. Environ. Manage,*96: 86–90.

Eckard, R.J., Grainger, C. and de Klein, C.A.M. (2010). Options for the abatement of methane and nitrous oxide from ruminant production: A review. *Livest. Sci.,*130: 47–56.

Garnett, T. (2007). Meat and Dairy production and consumption: Exploring the livestock sector's contribution to the UK's greenhouse gas emissions and assessing what less greenhouse gas intensive systems of production and consumption might look like. *Food Climate Research Network,* 85:684-873.

Meda, A., Hassouna, M., Aubert, C., Robin, P. and Dourmand, J.Y. (2011). Influence of rearing and manure management practices on ammonia and greenhouse gas emissions from poultry houses. *World Poultry Science Journal*, 67: 441–445.

Millner, P.D. (2009). Bioaerosols associated with animal production systems. *Bioresource Technology*, 100: 5379 –5385.

Sejian, V., Lal, R., Lakritz, J. and Ezeji, T. (2010). Measurement and prediction of enteric methane emission. *International Journal of Biometeorology,*1-16.