EVALUATION OF DIETARY INCLUSION OF DIRECT FED MICROBES (DFM) ON GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF BROILER CHICKEN

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Abstract
A 56 days study was carried out using a total of 96-day-old breed of Ross 308 to evaluate the dietary inclusion of Direct Fed Microbes (DFM) on the growth performance and carcass characteristics of broiler chicken. There were twenty-four birds in each treatment and eight birds per replicate. Four experimental diets were formulated; T1 (0% DFM), T2 (2.5% DFM), T3 (5% DFM) and T4 (7.5% DFM) .Feed and water were given ad libitum throughout the duration of the experiment which lasted 56 days. Cut carcass parts were weighed and recorded. Data obtained were subjected to statistical analysis. The growth performance parameters such as final weight, daily weight gain, daily feed intake and feed conversion ratio of the four treatment diets showed no significant differences ($p<0.05$). The carcass characteristics of the broiler chicken such as dressing percent, wings, hearts and large intestine were significantly different among the four treatment. T_2 (2.5% DFM) recorded the most significant for dressing percent and wing weight, whereas, T_3 (5.0%) DFM recorded least value in the two traits considering dressing percent and wing weight. Also, T_2 significantly produced higher dressing percent and wing weight compared to other experimental diets (T_3 and T_4). It was therefore concluded that broiler diet could be supplemented with not more than 2.5% Direct Fed Microbes without having any deleterious effects on growth and carcass characteristics of broiler birds.

Keywords: Dietary Inclusion, Direct Fed Microbes, Growth Performance, Carcass Characteristics, Broiler Chicken

Introduction

The biggest challenge of commercial poultry production is the availability of good quality feed on sustainable basis at stable prices. In spite of this challenge commercial poultry ranks among the highest source of animal protein (Iyayi, 2008). The increase in the size of poultry industry has been faster than other food producing animal industries. The trade volume of poultry product has also increased parallel to the rapid growth of global poultry meat and egg production (Wind and horst, 2006). Available statistics indicate that the poultry meat industry has been more dynamics compared with the egg industry over these years (Wind horst, 2006). Feed is the major component of the total cost of production for meat and egg production in the poultry industry.

The poultry industry has becomes an important economic activity in many countries in large scale rearing facilities where poultry are exposed to stressful condition, problems related to disease and deterioration of environmental conditions often occurs and results in the misuse of antibiotics as growth promoters in animal feed as well as the treatment of animal (Marshall and Levy 2011). Poultry industry is now facing ban in the use of antibiotic in the European Union for over a decade now. The use of antibiotics at low dosage showed to be very efficient as growth promoters especially to increase weight gain, regulate gut flora and increase productivity. However, its excessive use led to the development of antibiotic resistance, a serious risk for animal and human health. Probiotics is an alternative feed additive for disease prevention and growth-enhancing supplement to overcome this problem maintain the internal microflora by controlling the overgrowth of potential pathogenic bacteria (Raja *et al* 2009). The natural bacterial flora (e.g probiotic bacterial represents a promising alternative therapy. Probiotics are microorganism that upon ingestion in certain numbers exerts health effect beyond inherent basic nutrition (Guarner and Sehaafsna, 1998). The role of probiotic have been established as a very sound alternative to antibiotics growth promoters, which affect the host animal by improving its intestinal microbial balance (Ghadban, 2002, Peterson, and Burkholder, 2003). This research was carried out to evaluate the dietary inclusion of Direct Fed Microbes (DFM) on growth performance and carcass characteristics of broiler chicken.

Keywords: Dietary Inclusion, direct Fed Microbes, Growth Performance, Carcass Characteristics, Broiler birds

Materials and Method

This study was carried out at the Poultry Unit of

the Teaching and Research Farm of Michael Okpara University of Agriculture Umudike, Abia State of Nigeria. It is located at Latitude 5° 29°N and Longitude 7° 33°E in the rain forest zone of South East Nigeria (NRCRI, 2006).

A Total of Ninety six (96) Ross 308 broiler birds were used for this study with an average weight of about 50g. The experimental designs used for the experiment were Complete Randomized Design (CRD). The birds were randomly divided into four experimental treatments, T_1 (0% DFM), T_2 (2.5% DFM), T3 (5% DFM) and T_4 (7.5% DFM). Each treatment had three replicate of 8 birds per replicate. The birds in treatment one serves as control

The experimental animals were bought from a reputable Hatchery, the feedstuffs were purchased from Jocan Nig. Ltd, Umuahia, Abia State. The Direct Fed Microbes (DFM) were purchased from Eggriculture Inc USA and distributed by Farm Associates Nig. Ltd. Enugu State. Feed and water were provided *ad-libitum*. All the parameters on growth were taken and recorded.

Data were collected on growth parameters such as weight gain, feed intake, feed conversion ratio, Average weekly weight gain, and average weekly feed intake. The initial body weights of the birds were measured on the first day of the experiment. Subsequent body weight was measured on weekly basis using a 25kg capacity weighing scale. Carcass weight was determined using a table weighing balance. All data obtained were subjected to Analysis of Variance (ANOVA) (Steel and Torrie 1980) and the significant effects between treatment means were separated using Duncan New Multiple Range Test (Duncan 1955) where the significant difference were determined

Results and Discussion

The treatments with various DFM inclusion performed similar in growth performance to the control diets (0% DFM) as presented in Table 3. No significant differences ($p>0.05$) were observed in initial weight, final weight, daily weight gain, daily feed intake (DFI) and feed conversion ratio (FCR) of the four treatment diets. In other words, the findings suggests that up to 7.5% of DFM can be included in the diets of broiler chickens without any detrimental effect. The final weight of the control diet (T_1) portrayed a higher value (2,700 g) compared to the values recorded for the trial diets, though they were not significantly different from one another. Similar observation was made in daily weight gain. The daily feed intakes (190.3, 176.67 and 182.45 g/day) of the trial diets (T_2, T_3 and T_4 respectively) were higher than that of the control diet (164.62 g/day) though not significantly different. The FCR of the control diet was also numerically lower and better than that of the trial diets.

Significant differences ($p<0.05$) were observed in dressing percent, wings, heart and large intestine, whereas no significant differences ($p>0.05$) were observed in the other parameters. The 2.5% DFM recorded the most significant values for dressing percent and wing weight whereas the 5% DFM (T_3) recorded the least value in the two traits. T_4 (15% DFM) recorded the highest value ($p<0.05$) for large intestine weight expressed as percentage liveweight than T_1, T_2 and T_3 which are similar. The higher large intestinal weight of T_4 may be as a result of the level of the DFM used in the diet which increased the large intestinal weight. The control diet recorded the most significant heart weight followed similarly by T_2 and T_3, whereas, T_4 recorded the least value. Therefore, the supplementation of the broiler chicks' diet with DFM led to a decline in the heart weight as the level of supplementation increased.

Variable results have been observed in carcass performance with the inclusion of dietary probiotics. Mohamed *et al.* (2015) observed that the inclusion of dietary probiotics had no significant ($P \geq 0.05$) effects on dressing percentage and relative weights of heart, gizzard and abdominal fat, which contradicts the result, reported in this study for dressing percent and heart weight but agrees with that of abdominal fat and gizzard. Karaoglu and Durdag (2005) and Rezaeipour *et al.* (2012) revealed that dietary probiotic had no effect on carcass characteristics, which disagrees with the significant parameters obtained in this study. However, other researchers have also shown that the use of probiotics significantly improved carcass characteristics of broiler chickens (Paryad and Mahmoudi, 2008; Zhang, 2006; Kannan *et al.*, 2005; Panda *et al.*, 2000; Onifade *et al.*, 1998; Jin *et al.*, 1998; Haj Ayed *et al.*, 2004; Sultan *et al.*, 2006; Chumpawadee *et al.*, 2008). The result of this study similarly portrayed significant increases in the dressing percent, wing weight, heart weight and large intestinal weight as earlier noted.

Conclusion and Recommendation

The findings in this study showed that it is apparent that the inclusion of DFM in broiler chickens diet did not improve or adversely affect their growth performance but produced variable results in their carcass performance among the four treatment diets. The 2.5% level of dietary inclusion of DFM recorded better carcass performance in terms of its

dressing percent, wing weight, thigh weight and small intestinal weight and can be recommended to farmers for adoption. The 2.5% DFM level inclusion is recommended for adoption in broiler chicken diets due to its outstanding properties enumerated above. Other strains of beneficial microbes can be combined with the 2.5% level of Smartchoice DFM in this study in an attempt to confirm their efficacy in improving growth performance as well as carcass performance characteristics of broiler chickens.

References

Chumpawadee, S.; Chinrasri, O.; Somchan, T.; Ngamluan, S. and Soychuta, S. (2008). Effect of Dietary Inclusion of Cassava Yeast as Probiotic Source on Growth Performance, Small Intestine (Ileum) Morphology and Carcass Characteristic in Broilers. International Journal of Poultry Science; 7(3): 246-250.

Ghadban, G.S. (2002). Probiotics in broiler production-A review. Arch. Für Geflügelkunde, 66: 49-58.

Haj Ayed, M.; Laamari, Z. and Rekik, B. (2004). Effects of incorporating an antibiotic "Avilamycin" and a probiotic"Activis" in broiler diets. *American Society of Animal Science; 55:237-240.*

Gunal, M.; Yayli, G.; Kaya, O.; Karahan, N. and Sulak, O. (2006). The effects of antibiotic growth promoter, probiotic or organic acid supplementation on performance, intestinal microflora and tissue of broiler. International Journal of Poultry Science;5:149-155.

Jin, L.Z.; Ho, Y.W.; Abdullah, N. and Jalaludin, S. (1998). Growth performance, intestinal microbial populations and serum cholesterol of broilers fed diets containing Lactobacillus cultures. *Poultry Science 1998; 77:1259-1265.*

Iyayi, E,. A, 2008: Prospects and challange of unconvectional poultry feed stuffs. Niger-Poult – Sci. J. 5(4) : 186 – 194.

Kannan, M.; Karunakaran, R.; Balakrishnan, V. and Prabhakar, T.G. (2005). Influence of prebiotics supplementation on lipid profile of broilers. Int. J. Poult. Sci., 4(12): 994-997.

Karaoglu, M. and Durdag, H. (2005). The influence of dietary probiotic (*Saccharomyes cerevisiae*) supplementation and different slaughter age on the performance, slaughter and carcass properties of broilers. Int. J. Poult. Sci.;4:309–316.

Mohamed, E.A.; Talha, E.A.; Mojahid, A.A. and Dafaalla, E.M. (2015). Effect of Dietary Yeast (*Saccharomyces cerevisiae*) Supplementation on Performance, Carcass Characteristics and Some Metabolic Responses of Broilers. Animal and Veterinary Sciences; 3(5-1): 5-10.

Onifade, A.A.; Odunsi, A.A.; Babatunde, G.M.; Olorede, B.R. and Muma, E. (1998). Comparison of the supplemental effects of Saccharomyces cerevisiae and antibiotics in low-protein and high-fiber diets fed to broiler chicken. Arch Anim Nutr.; 52: 29–39.

Table 1: Ingredients Composition of Broiler Starter Diets containing Different levels of DFM

INGREDIENTS %	T_1 (0%DFM)	T_2 (2.5% DFM)	T_3 (5%DFM)	T4 (7.5%DFM)
Maize (Yellow)	50.00	50.00	50.00	50.00
Soya bean meal	25.00	25.00	25.00	25.00
Wheat offal	8.00	8.00	8.00	8.00
Fish meal	3.00	3.00	3.00	3.00
Palm kernel cake	10.00	9.50	9.00	8.50
Bone meal	3.00	3.00	3.00	3.00
Lysine	0.25	0.25	0. 25	0.25
Methionine	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Vitamin/min Premix	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Crude protein	95.95	22.93	22.91	22.89
ME (Kcal/ kg)	2945	2930	2945	2950

Premix supplied per kg of starter diets vitamin A, 1500, vitamin D3 1300 Iμ, Thiamine 2mg, Riboflavin 6mg, pyridoxine 4mg, Nacl 40mg, Cobalmine 0.05g, Biotic 0.08g, Chlorine chloride 0.05g, Manganese 0.096g, Zinc 0.06g, Iron 0.024g, Copper 0.006g, Iodine 0.014g.

Table 2: Ingredients Composition of Broiler Finisher Diets containing Different levels of DFM

Ingredients %	T_1 (0%DFM)	T_2 (2.5% DFM)	T_3 (5%DFM)	T4 (7.5%DFM)
Maize (Yellow)	52.00	52.00	52.00	52.00
Soya bean meal	20.00	20.00	20.00	20.00
Wheat offal	10.00	10.00	10.00	10.00
Fish meal	3.00	3.00	3.00	3.00
Palm kernel cake	11.00	10.50	10.00	9.50
Bone meal	3.00	3.00	3.00	3.00
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Vitamin/min premix	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**
Crude protein	20.86	20.53	20.34	20.22
M E (Kcal/kg)	3050	3062	3068	3071

Premix supplied per kg of finisher diet vitamin A 10,000, vitamin D3 12000 Iμ, Vitamin E, 20 Iμ, Thiamin 2mg, Riboflavin 3mg, pyridoxine 4mg, Nacin 20mg, cobalamin,0.05g, Biotic 0.08mg, chlorine chloride 0.02g, folic acid 0.5mg, manganese 0.006g, Zinc 0.03g, Iron 0.024g, Copper 0.006g, Iodine 0.0014g, selenium 0.25mg, Cobalt 0.02g.

Table 3: Growth performance of broiler chickens fed diets containing different levels of DFM

Parameter	T_1 0%	T_2 2.5%	T_3 5%	T_4 7.5%	SEM
Initial weight (g)	50.00	50.00	50.00	50.00	0.00
Final weight (g)	2700.00	2466.67	2566.67	2566.67	77.97
Daily weight gain (g/day)	47.32	43.15	44.94	44.94	1.39
Daily feed intake (g/day)	164.62	190.30	176.67	182.45	4.56
Feed conversion ratio	3.49	4.53	3.93	4.08	0.19

Means did not differ significantly at $p>0.05$; SEM = Standard error of the mean

Table 4: Carcass characteristics of broiler chickens fed diets containing different levels of DFM

Parameter	T_1 0%	T_2 2.5%	T_3 5%	T_4 7.5%	SEM
Live weight (lwt) (g)	1966.67	2033.33	1966.67	1850.00	38.66
Defeathered weight (g)	1740.00	1850.00	1666.67	1675.00	35.89
Dressed weight (g)	1352.67	1440.33	1299.00	1279.50	33.22
Dressing percent	68.77^{ab}	70.85^{a}	65.89^{b}	69.24^{ab}	0.78
Cut parts as % of liveweight					
Abdominal fat	1.14	0.92	0.88	1.01	0.10
Breast weight	18.22	20.70	19.77	18.52	0.62
Back cut	14.68	14.65	13.17	15.12	0.37
Shank	3.78	3.65	3.42	3.40	0.14
Thigh	11.19	11.42	9.85	10.42	0.25
Drumstick	8.90	8.69	8.39	9.27	0.18
Wings	8.79^{ab}	8.66^{a}	8.05^{b}	8.78^{ab}	0.18
Offals/Organs as % of liveweight					
Head	2.58	2.81	2.84	2.76	0.13
Neck	3.21	3.08	3.24	3.73	0.13
Crop	0.44	0.43	0.36	0.51	0.03
Proventriculus	0.58	0.64	0.50	0.54	0.02
Spleen	0.12	0.15	0.12	0.14	0.01
Liver	2.12	2.06	1.94	2.22	0.05
Heart	0.53^{a}	0.46^{ab}	0.50^{ab}	0.43^{b}	0.02
Kidney	0.37	0.56	0.50	0.53	0.05
Gizzard	2.09	2.09	2.17	1.98	0.08
Small intestine	3.27	3.53	3.05	3.25	0.15
Large intestine	0.41^{b}	0.44^{b}	0.43^{b}	0.62^{a}	0.03
Lungs	0.61	0.61	0.68	0.65	0.04

a,b Means across rows differed significantly at $p<0.05$; SEM = Standard error of the mean