Evaluating The Growth Performance of Gold Neslink Pullets Fed with An Egg Enhancing Bio-Fortified Cassava (Mannihot esculenta Cranz) Root Meal

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DOI: 10.56201/ijaes.v10.no9.2024.pg30.38

Abstract

A study was conducted to investigate the effects of adding an egg-enhancing supplement (Farmers Solution Provider: Multiple Dropping-FSPMD) to a cassava-based diet on the performance of egg-type chickens. The study lasted for 8 weeks and involved 300 Gold Neslink pullets randomly assigned to 10 dietary treatments with varying levels of cassava root meal (CRM) replacement and FSPMD supplementation. The results showed significant differences in feed intake, body weight gain, feed cost, age at first lay, and weight of first egg among treatments, but no significant differences in feed conversion ratio and feed cost per kilogram gain. The addition of FSPMD did not affect mortality rates during the study period

Keywords: *Performances, Pullets, Bio-fortifier, CRM, FSPMD*

INTRODUCTION

The consumption of animal protein in developing countries is significantly lower than the recommended daily intake, with Nigeria being a prime example. According to the Food and Agriculture Organization (FAO, 2006), Nigerians consume less than 10g of protein per day, with only 3.2g derived from animal sources. This protein deficit has been exacerbated by poverty and the high cost of animal feed (Aderolu, 2003). Poultry farming has the potential to bridge this protein gap in developing countries, where daily consumption falls far short of recommended standards (Onyimonyi et al., 2009). However, the high cost of feed, which accounts for 70-80% of the total production costs for intensively reared poultry (Omeje et al., 1999; Ijaiya et al., 2004), poses a significant economic constraint. The scarcity and high demand for cereals in Nigeria further exacerbate the economic challenges of poultry production (Adejumo, 2004).

The demand for affordable animal products has led to the exploration of local feed ingredients as alternatives to conventional inputs (Oluokun, 2001). Processed cassava root meal has been identified as a potential substitute for maize in poultry diets. Cassava, a widely cultivated and readily available tuber crop, offers a promising energy source with a high metabolizable energy content (2680 Kcal kg-1) and competitive pricing (Aduku, 1993). However, its low protein content (2.66%) and limited essential vitamins and minerals necessitate nutrient balancing to ensure optimal performance (Eruvbetine et al., 1994). This can be achieved through the incorporation of protein-rich cassava leaves, seeds, or cakes, or supplementation with synthetic amino acids and multiple protein sources (Ngika et al., 2014). Proper protein balancing enables cassava meal to completely replace maize in poultry diets

(Oruwari et al., 2003). Moreover, biofortification of cassava with micronutrients like vitamin A, iron, and zinc is crucial in regions where deficiencies are prevalent (Montagnac et al., 2009). The use of cassava as an alternative energy source could significantly reduce feed costs (Ukachukwu, 2005).

The animal feed industry continues to evolve, with manufacturers like Levjenau Agro & Electrical Company Limited developing innovative supplements aimed at enhancing the performance of laying birds. Their recent product, Farmers Solution Provider: Multiple Dropping (FSPMD), is an organic supplement purported to induce early ovulation, increase egg laying frequency, and enlarge egg size. However, there is a lack of scientific evidence to substantiate these claims. To investigate the efficacy of FSPMD, an on-farm study was designed to compare the performance of egg-type chickens fed either a standard diet or a bio-fortified cassava root meal supplement. This study aims to provide empirical evidence to support or refute the manufacturer's claims and contribute to the existing body of knowledge on poultry nutrition and productivity.

MATERIALS AND METHODS

The study was conducted at the Department of Animal Science Teaching and Research Farm, University of Nigeria, Nsukka. Nsukka lies in the Derived Savannah region, and is located on Longitude 6^{o} 25´ N and Latitude 7^{o} 24´ E (Ofomata, 1975).

Three hundred (300) 12-week old Gold Neslink pullets were used for the study. The birds were weighed and randomly assigned to the ten dietary treatments at thirty birds each. Each treatment had three replications of ten birds each. Feed and water were provided *ad libitum*. Routine vaccination and necessary medication were given to the birds.

The cassava roots were purchased from the local market. The roots were peeled, washed, chopped and sun-dried. The dried chips were grounded in a hammer mill and the resulting meal was used in the experimental diet. An organic egg enhancing supplement – Farmers solution provider: multiple dropping (FSPMD) was purchased from Nia Agro Investment Nig. Limited located at Onitsha-Owerri Express Way, behind First City Monument Bank, Ihiala, Anambra State. This was used to fortify the cassava based diets. .

The cassava root meal was included in formulated experimental diets at graded levels of 0, 25, 50, 75, and 100% in replacement of maize while the FSPMD was included at the rate of 100g/100kg feed for the growers as recommended by the manufacturer (Levjenau Agro & Electrical Co., Ltd.). The Company is based in Malaysia.Ten experimental diets were formulated. Five of the experimental diets were fortified with the organic supplement while the other five were not fortified. The diet was formulated to be isonitrogenous (16% CP) for pullets (Tables 1). The Proximate composition of experimental diets were as depicted in Table 3**.** The grower phase lasted for eight (8) weeks (from 13^{th} - 20^{th} week). Data obtained were subjected to analysis of variance (ANOVA) in a 5 x 2 factorial in Completely Randomized Design (CRD) as described in Statistix (2003) version 8.0. Means were separated using Duncan New Multiple Range Test (DNMRT) at $P < 0.05$.

Table 1: Percentage composition of pullets' diet containing cassava root meal with or without FSPMD

	GROWER PHASE									
INGREDIENT	**T1 (0)**	**T2 (25)**	**T3 (50)**	**T4 (75)**	**T5 (100)**	**T6 (0)**	**T7 (25)**	**T8 (50)**	**T9 (75)**	**T10 (100)**
Maize	48	36	24	12	0	48	36	24	12	0
Cassava	0	10	20	30	40	0	10	20	30	40
Soybean meal	12	14	16	18	20	12	14	16	18	20
wheat offal	28	28	28	28	28	28	28	28	28	28
PKC	5	5	5	5	5	5	5	5	5	5
Fish meal	2	2	2	2	2	2	2	2	2	2
Bone meal	4	4	4	4	4	4	4	4	4	4
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
VMP	0.25	0.25	0.25	0.25	0.25	0.15	0.15	0.15	0.15	0.15
FSPMD	0	0	0	0	0	0.10	0.10	0.10	0.10	0.10
TOTAL	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
CP(%)	16.03	16.12	16.19	16.29	16.29	16.03	16.12	16.19	16.19	16.29
CF(%)	5.89	5.75	5.65	5.41	5.41	5.89	5.75	5.65	5.65	5.41
ME(kcal/kg)	2628	2626	2624	2622	2619	2628	2626	2624	2622	2619
Cost of feed /kg (₦)	93.00	91.86	90.72	89.57	88.43	95.00	93.86	92.72	91.57	90.43

The organic bio-fortifier- Farmers Solution Provider: Multiple Dropping, an egg enhancing supplement furnished the following amounts of other ingredients per kilogramme of feed: Vitamin A-125000µ ; Vitamin E-4000µ ; Vitamin B2-50mg ; Vitamin B6-10mg ; Vitamin D-15000µ ; Herba epimedii-20mg ; Motherwort-100g ; Isatis root-50g ; Astragalus mongholicus-50g ; Adenophora stricta-50g ; Medicated leaven-200mg and Desert cistanche-50g.

Table 2: Proximate composition of experimental pullets diet with or without FSPMD (Dry matter basis)

	Treatments									
Parameters (%)	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}
CP	16.28	16.03	15.95	16.40	16.32	16.48	16.13	15.89	16.18	16.22

CF	5.12	5.34	5.27	5.11	4.86	5.02	5.24	5.91	4.61	5.06
EE	4.30	4.43	3.98	4.10	4.00	4.50	3.93	4.50	3.87	4.00
Ash	4.17	3.95	4.19	4.34	4.75	4.15	4.01	4.08	4.23	4.02
NFE	70.13	70.25	70.61	70.05	70.07	69.85	70.69	69.62	70.56	70.70

RESULTS AND DISCUSSIONS – PHASE 1 (Growing stage**)**

Production attributes of the experimental birds during the grower phase are shown in Table 3.

AVERAGE DAILY FEED INTAKE, ADFI (g/b/d) :

The average daily feed intake (ADFI) values ranged from 48.98 ± 1.46 to 55.97 ± 0.76. The results showed that treatments T1-T5 had similar ADFI values ($P > 0.05$), which were significantly lower ($P < 0.01$) than those of treatments T6-T10, which also had similar values among themselves ($P > 0.05$). This indicates a significant difference ($P < 0.01$) in ADFI between the groups with and without fortification. No significant effects of cassava level ($P > 0.05$) or fortifier-cassava interaction ($P > 0.05$) were observed. The addition of FSPMD to the diet containing cassava root meal (CRM) may have mitigated the anti-nutritional effects of hydrocyanic acid, improving digestibility (White et al., 1981). Moreover, the addition of FSPMD may have enhanced palatability, leading to increased feed intake, consistent with the findings of Bamgbose et al. (2007), Onifade and Babatunde (1997), and Nwokoro and Tewe (1995), who reported improved feed intake in finishing turkeys, broiler chicks, and laying hens fed bio-fortified or supplemented rations.

DAILY BODY WEIGHT GAIN, DBWG (g) :

The mean values of the daily body weight gain range from 17.92 ± 0.08 - 21.00 ± 0.67. T_1 - T_5 had similar ($P > 0.05$) daily body weight gain values, which were however lower ($P < 0.01$) than the daily body weight gain values of T_6 – T_{10} whose values were similar ($P > 0.05$) among themselves. This implies that the birds fed diets that contained the FSPMD were able to absorb more nutrients from the diets that aided the development of the muscles which is consistent with the report of Adeyemo *et al*. (2013). Inclusion of organic fortifiers to cassava in monogastrics' feed can reduce viscosity of the digester in the intestine. Dietary supplementation with organic fortifiers is capable of hydrolyzing endosperm cell walls and has increased performance of poultry birds receiving cassava based diets (Abdulrashid et al., 2007).

FEED CONVERSION RATIO (FCR) :

The mean values of the feed conversion ratio range from 2.66 ± 0.10 - 2.83 ± 0.02. The effects of treatments on FCR were not significant. T_1 - T_5 had similar ($P > 0.05$) FCR values, which however is the same with the FCR values of T_6 - T_{10} whose values were also similar ($P > 0.05$). Feed conversion ratio is crucial for the birds to meet up with their dietary requirements. Since FCR is a factor of feed consumed and body weight, it therefore follows that; an increase in feed intake will correspondingly enhance growth with superior FCR. The FCR recorded in the present work are within the range of 2-4 reported by FAO (2010) and Nombor (2012).

AGE AT FIRST LAY, AFL (days) :

The mean values for age at first lay (AFL) range from 123.67 ± 0.67 - 139.67 ± 1.45 days (18 - 20weeks). T_1 - T_5, T_7 and T_8 had similar ($P > 0.05$) AFL values. T_6 value was however lower ($P < 0.05$) than AFL values of T_2, T_4, T_7, T_8, T_9 and T_{10}. Significant ($P < 0.05$) effects of cassava level were observed. The result is within the average range reported by (Akouango *et al.*, 2010; Fosta and Manjeli, 2010 and Kreman, 2012). However, from the experiment, it was observed that the treatments that contained the FSPMD delayed the onset of egg laying compared to other treatments (**Table 3**). This is attributed probably to delay in formation of egg follicles. This delay in the onset of egg laying is preferable as the birds are likely to lay heavier eggs later which will translate to increased income to the farmer (Kargbo and Kanu, 2017).

WEIGHT OF FIRST EGG, WFE (g):

Mean values for weight of first egg (WFE) range from 32.33 ± 6.23 - 49.67 ± 1.45 g. T_1 and T_5 WFE values were similar ($P > 0.05$) but were lower ($P < 0.01$) than value of T_9 and T_{10}. T_2, T_3, T_4, T_6, T_7 and T_8 WFE values were similar ($P > 0.05$) among themselves. There were significant ($P < 0.05$) effects of cassava level for WFE.The lowest first egg weight (32. 33 ± 6.23) was recorded in T_1 which had no FSPMD. This implies that organic fortifier had the tendency of increasing egg weight early enough (**Table 3**) during the production life of layers. The result is in agreement with the report of Kargbo & Kanu (2017) who found the range of first egg weight of grower pullets fed neem leaf meal to be 31.53 ± 2.71 - 45.53 ± 4.12.

Table 3: Production attributes of the experimental laying birds – Phase 1: Growing stage

Parameter	Fortifier	Cassava Levels 0%	25%	50%	75%	100%	Mean
ADFI (g/b/d)	Non fortified	50.68 ± 0.05	50.57 ± 0.61	48.98 ± 1.46	49.21 ± 0.90	50.61 ± 0.32	**50.01 ± 0.67[b]**
	Fortified	55.14 ± 0.61	55.31 ± 0.66	55.97 ± 0.76	55.80 ± 0.45	55.92 ± 0.18	**55.63 ± 0.53[a]**
	Mean	**52.91 ± 0.33**	**52.94 ± 0.64**	**52.48 ± 1.11**	**52.51 ± 0.68**	**53.27 ± 0.25**	**52.82 ± 0.60**
	Prob.: Fortifier (P<0.01); Cassava (P>0.05); Fortifier*Cassava (P>0.05)						
ADBWG (g)	Non fortified	18.05 ± 0.08	17.92 ± 0.12	18.24 ± 0.16	18.03 ± 0.20	17.92 ± 0.08	**18.03 ± 0.13[b]**
	Fortified	20.21 ± 0.65	20.39 ± 0.66	20.53 ± 0.45	21.00 ± 0.67	20.65 ± 0.57	**20.56 ± 0.60[a]**
	Mean	**19.13 ± 0.37**	**19.16 ± 0.39**	**19.39 ± 0.31**	**19.52 ± 0.44**	**19.29 ± 0.33**	**19.29 ± 0.37**
	Prob.: Fortifier (P<0.01); Cassava (P>0.05); Fortifier*Cassava (P>0.05)						
FCR	Non fortified	2.81 ± 0.02	2.83 ± 0.02	2.70 ± 0.09	2.71 ± 0.03	2.82 ± 0.02	**2.77 ± 0.04**
	Fortified	2.74 ± 0.07	2.73 ± 0.10	2.73 ± 0.03	2.66 ± 0.10	2.71 ± 0.06	**2.71 ± 0.07**
	Mean	**2.78 ± 0.05**	**2.78 ± 0.06**	**2.72 ± 0.06**	**2.69 ± 0.07**	**2.77 ± 0.04**	**2.74 ± 0.06**
	Prob.: Fortifier (P>0.05); Cassava (P>0.05); Fortifier*Cassava (P>0.05)						
FC/kg gain (₦)	Non fortified	2611.07 ± 13.97	2526.85 ± 83.99	2373.04 ± 152.86	2432.37 ± 25.62	2481.76 ± 20.52	**2485.02 ± 59.39**
	Fortified	2588.63 ± 52.16	2541.36 ± 112.27	2529.18 ± 29.85	2442.06 ± 91.73	2453.26 ± 57.39	**2510.90 ± 68.68**
	Mean	**2599.85 ± 33.07**	**2534.11 ± 98.13**	**2451.11 ± 91.36**	**2437.22 ± 58.68**	**2467.51 ± 38.96**	**2497.96 ± 64.04**
	Prob.: Fortifier (P>0.05); Cassava (P>0.05); Fortifier*Cassava (P>0.05)						

Parameter	**Fortifier**	**0%**	**25%**	**50%**	**75%**	**100%**	**Mean**
AFL (days)	Non fortified	128.67 ± 4.18	132.67 ± 3.84	127.67 ± 2.19	135.33 ± 1.20	128.00 ± 2.52	**130.47 ± 2.79[b]**
	Fortified	123.67 ± 0.67	135.33 ± 2.40	132.33 ± 2.60	139.67 ± 1.45	139.33 ± 1.20	**134.07 ± 1.66[a]**
	Mean	**126.17 ± 2.43[c]**	**134.00 ± 3.12[ab]**	**130.00 ± 2.40[bc]**	**137.50 ± 1.33[a]**	**133.67 ± 1.86[ab]**	**132.27 ± 2.23**
	Prob.: Fortifier (P<0.05); Cassava (P<0.05); Fortifier*Cassava (P>0.05)						
WFE (g)	Non fortified	32.33 ± 6.23	44.00 ± 1.00	40.67 ± 2.33	42.67 ± 1.45	39.00 ± 2.08	**39.73 ± 2.62[b]**
	Fortified	44.33 ± 0.67	45.67 ± 0.67	46.00 ± 0.58	49.67 ± 1.45	47.33 ± 1.45	**46.60 ± 0.96[a]**
	Mean	**38.33 ± 3.45[b]**	**44.83 ± 0.84[a]**	**43.33 ± 1.46[ab]**	**46.17 ± 1.45[a]**	**43.17 ± 1.77[ab]**	**43.17 ± 1.79**
	Prob.: Fortifier (P<0.01); Cassava (P<0.05); Fortifier*Cassava (P>0.05)						
Mortality (%)	Non fortified	1.85 ± 0.37	1.48 ± 0.37	0.74 ± 0.74	1.11 ± 0.64	1.11 ± 0.64	**1.26 ± 0.55**
	Fortified	1.48 ± 0.74	1.11 ± 0.64	0.74 ± 0.37	0.37 ± 0.37	1.11 ± 0.64	**0.96 ± 0.55**
	Mean	**1.67 ± 0.56**	**1.30 ± 0.51**	**0.74 ± 0.56**	**0.74 ± 0.51**	**1.11 ± 0.64**	**1.11 ± 0.55**
	Prob.: Fortifier (P>0.05); Cassava (P>0.05); Fortifier*Cassava (P>0.05)						

Row and column means with different superscript are statisticallydifferent at 1% or 5%

CONCLUSION/RECOMMENDATION:

The present study revealed that egg-type chicken fed cassava based ration fortified with Farmers solution provider: multiple dropping (FSPMD) has the tendency of significantly improving (P < 0.01) performance indices such as: Average daily feed intake, Daily body weight gain, Feed Conversion Ratio, Age at first lay, Weight of first egg and mortality. At the end of **PHASE 2: laying stage**, a better and more appropriate recommendation (s) of the effect of FSPMD will be clearer.

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