PERFORMANCE CHARACTERISTICS, NUTRIENTS DIGESTIBILITY AND COST BENEFITS OF LAYING HENS FED GOLDEN MORN WASTE AS REPLACEMENT FOR MAIZE

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Abstract

The study investigated the effects of inclusion levels of Golden Morn Waste (GMW) as a replacement for maize on the performance of laying hens. A total of 96 Oba Marshal strain laying hens of average weight 1.48Kg were allotted to four experiment diets containing 0%, 10%, 20% and 30% inclusion levels of GMW. Eight laying hens were replicated three times per experimental diet in a completely randomized design. The result of the chemical analysis showed that GMW is higher in DM, CP, CF, EE, Ca and P compared to Maize. The replacement of Maize with GMW had significant (P<0.05) positive effects on feed intake, weight gain, hen day production and feed/dozen egg produced. The highest performance was obtained from hens fed 30% GMW. The highest nutrients digestibility was also obtained from laying hens fed 30% GMW. The cost of feed per dozen egg produced was also significantly (P<0.05) lower for laying hens offered 30% GMW. The study concluded that the inclusion of GMW in the diet of laying hens up to 30% improves the performance of the laying hens and reduces cost of feeding.

Keywords: Golden Morn Waste; laying hens; Performance; Feed cost.

Introduction

The cost of production of animal protein is high in Nigeria. This is due to the scarcity and high prices of the feed ingredients like maize. These scarcity and high prices may be linked to high demands from both humans i.e. through food and drink companies and livestock animals. This problem is responsible for over 800 million people suffering from malnutrition and it is not only as a result of insufficient food production and inadequate distribution, but also of the financial inability of the poor to purchase food of reasonable quality in adequate quantities to satisfy their needs (FAO, 1993). Maize is one of the major staple food items in developing countries like Nigeria and serves as a source of energy intake of low income households (Yotopoulos, 1985). In developed worlds, maize is also consumed but most times indirectly by converting it first to animal protein (CAST, 2013) through the feeding of livestock animals like poultry, pigs, ruminants etc. The competition of demand of this conventional feed ingredient i.e. maize between humans and animals has necessitated various researches on unconventional feed ingredients like agro-industrial, food company by-products, and roots and tubers for the production of animal protein at cheaper price rate in developing countries.

Materials and Methods

The experiment was carried out at the poultry unit of the Teaching and Research Farms, Federal University of Agriculture, Abeokuta, Nigeria. A total of ninety-six laying hens of Oba Marshal strain were used for the experiment. The laying hens were 44 weeks old and with average weight of 1.48Kg at the commencement of the experiment. They were allotted to four experiment diets containing 0%, 10%, 20% and 30% inclusion levels of GMW. Each of the treatment was replicated three (3) times with eight (8) laying hens per replicate in a completely randomized design. The experimental animals were housed in battery cages where feed and water were given ad libitum. The Golden Morn Waste used in this experiment was obtained from Nestle Food Company in Agbara, Ogun State. Routine medication was administered throughout the experimental period. The study lasted for eighty-four (84) days with a proper record of daily feed intake, daily faecal output and weekly bodyweight. Cost analysis was carried out using the current cost of feed ingredient and total feed consumed per dozen eggs produced by the experimental laying hens. Experimental diets and faecal samples were analyzed for proximate composition following the methods of AOAC, 1990. All data obtained were subjected to Analysis of Variance and the Duncan's Multiple Range Test, to detect significant differences among means.

Results and Discussion

The chemical compositions of Maize and Golden Morn Waste (GMW) are presented in Table 1. The crude protein, crude Fibre and M.E. levels are greater in GMW than in Maize which does not agree with Ayanwale *et al*, (2006) who reported that Cornflakes Waste is lower in CP and M.E. This may be as a result of addition of other ingredients used in the production of Golden Morn such as sucrose and soya bean flour.

Table 1: Chemical Composition of Maize and Golden Morn Waste (GMW)

Parameters (%)	Maize**	GMW
Dry matter	92	93.5
Crude Protein	10	14.3
Crude Fibre	2	7.2
Ether Extract	4	6.6
Ash	1.3	1.5
Calcium	0.02	0.46
Phosphorus	0.29	0.32
Metabolizable Energy (kcal/kg)	3420	3830

**(Adiku, 1992)

The gross and chemical compositions of the experimental diets are presented in Table 2 and 3. The compositions were adequate in meeting the requirements of the laying hens (NRC, 1994). The costs of the feeds per kg reduce at increasing level of replacing Maize with GMW. The cost of feed per kg is ₦56.90K and ₦51.50K respectively for the lowest (0%) and highest (30%) inclusion levels of GMW.

Table 2: Composition of the experimental diets

	Golden Morn Waste Inclusion (%)			
Ingredients	0	10	20	30
Maize	47	37	27	17
Golden Morn Waste	0	10	20	30
Fish meal (72%CP)	1	1	1	1
Soya bean meal	13	13	13	13
Groundnut Cake	7.5	7.5	7.5	7.5
Wheat Offal	15.3	15.3	15.3	15.3
Bone meal	2.5	2.5	2.5	2.5
Oyster shell	8	8	8	8
Layer's Premix	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Lysine	0.1	0.1	0.1	0.1
Methionine	0.1	0.1	0.1	0.1
Total	100	100	100	100
Cost per 100kg (N)	5690.5	5150.5	5330.5	5150.5
Cost per kg of feed (N/kg)	56.9	55.1	53.4	51.5

Table 3: Chemical Composition of Experimental diets base on Dry Matter

	Golden Morn Waste Inclusion Levels (%)			
Parameter	**0**	**10**	**20**	**30**
Dry Matter	92.5	92.82	93.3	93.6
Crude Protein	17.12	16.83	17.45	18.41
Crude Fibre	9.2	9.22	9.24	9.26
Ether Extract	3.4	3.65	3.91	4.17
Calcium	4.04	4.04	4.04	4.04
Phosphorus	0.61	0.59	0.56	0.56
M.E (MJ/kg)	10.34	9.21	10.69	10.89

The Total Feed Intake per bird (kg/bird) of the laying hens fed the experimental diets is shown in Table 4. The laying hens fed experimental diet at 30% replacement of GMW had significantly ($P<0.05$) the highest total feed intake (8.40kg/bird) among others. This may be due to high level of inclusion of GMW which is more palatable. The high feed intake is contrary to the result reported by Kana *et al*, (2013) when Maize was replaced by cassava meal in the diets of laying hens at varying level. There was no significant ($P>0.05$) difference in the total feed intake of laying birds fed experimental diets 2 (7.92kg/bird) and 3 (7.91kg/bird). There was significant ($P<0.05$) differences in the weight gained by the laying hens across all the experimental diets fed with the highest in birds (0.31kg) on diet with 20% GMW replacement level, followed by birds (0.25kg) on diet with 30% GMW replacement level and lowest in birds (0.10kg) on diet with no GMW inclusion. This is an indication that nutrient utilization was better when Maize and GMW were fed together to the laying hens than when Maize was fed separately (0% GMW inclusion). This result supports the report of Salami *et al*, (2003) about the associative effect of feed.

Table 4: Performance characteristics of laying hens fed experimental diets

	Golden Morn Waste Inclusion Levels (%)				
Parameters	**0**	**10**	**20**	**30**	**SEM**
Initial Live Weight (kg/bird)	1.49	1.48	1.49	1.49	0.01
Final Live Weight (kg/bird)	1.59^{d}	1.62^{c}	1.80^{a}	1.74^{b}	0.03
Weight Gained (kg/bird)	0.10^{c}	0.14^{c}	0.31^{a}	0.25^{b}	0.07
Total Feed Intake (kg/bird)	7.67^{c}	7.92^{b}	7.91^{b}	8.40^{a}	0.08
Hen Day Production (%)	66.60^{d}	69.50^{c}	73.33^{b}	75.17^{a}	1.01
Average Egg weight (g)	56.40^{d}	59.17^{c}	64.50^{b}	67.37^{a}	1.3
Feed/dozen egg (kg)	2.24^{d}	2.16^{c}	2.05^{b}	1.97^{d}	0.02
Mortality (%)	0	0	0	0	0

^{abc}- Means on the same row with different superscript are significantly different ($P<0.05$)
SEM- Standard Error Mean

The hen day production percentage varied significantly ($P<0.05$) with the increasing level of GMW inclusion, that is, the higher the inclusion level of GMW, the higher the egg produced by the hens. The experimental hens fed 30% GMW inclusion rate had highest egg production (75.17%) throughout the 84-day study trial which disagrees with the report by Kana *et al*, (2013). This may imply that the inclusion of GMW at 30% in the feed could be responsible for the increased utilization of the diet which resulted in improved egg production thereby upholding the findings of Salami *et al*, (2003).

The nutrient digestibility of laying hens fed the experimental diets is presented in table 5. The table showed that that there are significant ($P<0.05$) differences in the digestibility of nutrients across all the experimental diets by the laying hens. Crude protein digestibility of hens fed 20% GMW inclusion diet was observed to be the highest followed by hens on 30% GMW inclusion diet. Hens fed 30% GMW diet digested the dry matter, ether extract, nitrogen free extract and carbohydrate most among others.

Table 5: Nutrient Digestibility of Laying Hens Fed Experimental Diets

	Golden Morn Waste Inclusion levels (%)				
Parameters	**0**	**10**	**20**	**30**	**SEM**
Dry Matter	68.40^{c}	68.92^{bc}	69.22^{ab}	69.71^{a}	0.16
Crude Protein	76.22^{bc}	76.08^{c}	76.67^{a}	76.50^{ab}	0.08
Ether Extract	52.51^{c}	52.72^{b}	52.88^{a}	52.95^{a}	0.05
Ash	61.02^{b}	61.05^{b}	61.91^{a}	61.66^{ab}	0.16
Crude Fibre	64.95^{b}	64.64^{b}	66.50^{a}	66.79^{a}	0.29
Nitrogen Free Extract	60.21^{c}	61.62^{b}	62.02^{ab}	62.45^{a}	0.27
Carbohydrate	67.71^{c}	67.89^{bc}	68.25^{ab}	68.76^{a}	0.3

abc- Means on the same row with different superscript are significantly different ($P<0.05$)
SEM: Standard Error Mean

The cost benefit of feeding laying hens with the experimental diets is shown in table 7. The feed costs across the treatments are significantly different at P<0.05 ranging from ₦52.50 to ₦57.90. The diet containing 30% inclusion level of GMW has the least cost while the control diet has the highest cost. This could be attributed to the large difference between the price per kg of ₦55 and ₦37 for maize and GMW respectively. This finding is similar with the observations of Salami *et al*, (2003) and **Anaeto** *et al*, (2011) who reported that replacement of maize in the diets of layers with cassava led to reduction of feed cost and efficiency of conversion of feed to eggs respectively. The laying hens offered 30% GMW in the diet had significantly (P<0.05) the cheapest cost (₦104.47) of feed per dozen egg produced when hens on 20%, 10% and 0%GMW level of inclusion had ₦111.31, ₦120.61 and ₦129.69 respectively.

Table 7: Cost Benefit Analysis of Laying Hens fed Experimental Diets

	Golden Morn Waste Inclusion (%)				
Parameters	**0**	**10**	**20**	**30**	**SEM**
Cost of Feed (N/kg)	57.90[a]	56.10[b]	54.30[c]	52.50[d]	0.06
Total Cost of Feed/bird (N)	442.95[a]	444.47[a]	429.43[b]	441.03[a]	2.03
Cost of Feed/dozen Egg (N)	129.69[a]	120.61[b]	111.31[c]	104.47[d]	2.87

abc- Means on the same row with different superscript are significantly different (P<0.05)
SEM- Standard Error Mean

Conclusion

From the foregoing, it can be concluded that:

Laying hens can utilize up to 30% Golden Morn Waste in their diet without any adverse effects and with improved performance, nutrient utilization and productivity.

Golden Morn Waste could be used as energy source and to replace Maize up to 30% in laying hens' diet thereby reducing the cost of producing eggs (Animal Protein) for human population.

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