



EVALUATION OF THE PERFORMANCE OF JAPANESE QUAIL (*Coturnix coturnix japonica*) FED GRADED LEVELS OF DRIED SWEET ORANGE PEEL MEAL (*Citrus sinensis*)

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ABSTRACT

This study was conducted to evaluating the growth performance Japanese quails (*Coturnix coturnix japonica*) fed graded levels of dried sweet orange peel meal. A total of one hundred and eighty (180) birds were used for this study. A total of six experimental diets was formulated with inclusion levels of DSOPM at 0%, 2.5%, 5%, 7.5%, 10% and 12.5% respectively. Data was collected on feed intake, weight gain and feed conversion ratio. Data collected on performance parameters was subjected to analysis of variance and means was considered different at $P < 0.05$. The revealed that there was no significant ($P > 0.05$) difference in the mean initial body weight but in parameters such as the mean final body weight, mean body weight gain and feed conversion ratio, the result revealed significant ($P < 0.05$) difference and this was also observed for feed intake of quail birds fed the experimental diets. The study concluded that the performance of birds on inclusion diets of 0.5% - 10% Dried Sweet Orange Peel Meal (DSOPM) was similar but lower, compared with the higher values in the control diet. The study recommends that 10 – 15% inclusion may be considered since adult unsexed quails fed with the diets had an average weight which fell within the recommended average weight of adult quails (100-160g)

Keywords: Dried sweet orange peel, feed intake, feed conversion ratio and growth performance

INTRODUCTION

In order to meet the increasing worldwide demand for poultry and maintain its profitability, it is important to find new ways to stay competitive within the industry and decrease the cost of production as much as possible while achieving a high quality for consumers.

High cost of conventional protein feedstuffs has contributed to the poor performance or productivity of many animals in Nigeria and this has led to a shortage in the availability of animal protein to the citizenry (Adeniji and Jimoh, 2007). Efforts to reduce the high cost of feeds and therefore the cost of poultry products have concentrated on the use of cheaper and locally available alternative agro-by products especially those that have no nutritional value to mankind (Onu, 2007, Onu and Otuma, 2008, Okonkwo *et al.*, 2008, Oladunjoye and Ojebiyi, 2010).

In poultry production, feed cost also claims the largest share of the total expenses involved in the production process. Feed alone accounts for over 75% of the total cost of production, out of which 50% is expended on protein and energy sources (Ahaotu *et al.*, 2012). In the recent years, poultry nutritionists have aimed their researches towards the use of non-conventional feed ingredients in partial or total replacement of the conventional costly ingredients.

One of such feed ingredients is the sweet orange peel meal, a by-product of sweet orange (*Citrus senensis*) fruits which is not in competition with man's dietary needs. Incorporation of such products in animal feed would help in alleviating the problem of scarcity of feed supply that is having a negative effect on livestock industry most especially monogastric animal production. Its usage will also reduce environmental pollution problems. Orange peels are primary by-product produced by the fruit processing industry, and were used meal as natural feed additive, and even as medicinal supplement for animals (Callaway *et al.*, 2008).



Chemically, sweet oranges are valuable source of vitamin c as well as energy (Hasin *et al.*, 2006, Yang *et al.*, 2011).

The shortage of good quality feeds needed to sustain livestock growth, especially during the dry season has been a major challenge to the industry in the developing countries. A number of agro-based products such as the peel, Peel, seeds etc. are generated from fresh citrus after the main products of interest have been removed or extracted during processing or peeled for direct human consumption as in the case of developing countries. The use of non-conventional feed stuff in poultry diet such as orange peel is necessary in combating the rising feed and production costs, as well as decreasing environmental pollution. Therefore this study was aimed at evaluating the growth performance Japanese quails (*Coturnix coturnix japonica*) fed graded levels of dried sweet orange peel meal.

MATERIALS AND METHODS

Location of the study

This experiment was carried out at the poultry unit of the University of Abuja Teaching and Research Farm which is located along Airport Road FCT-Abuja. Having geographical location of Latitude 9°4'N longitude 7°28'E of about 1500mm (59.1in) rainfall annually, temperature range between 18.45°C (65.21°F) to 36.9°C (98.4°F), of relative humidity at 0900 GMT (percent) was at level of 68.7%.

Experimental Animals and Management

A total of one hundred and eighty birds was used for this study and these birds is obtained from Nigeria Veterinary Institute, Jos, Plateau State. The management of the young chicks was include with the provision of supplementary heat for 4 weeks under 24 hours lighting, and thereafter 9 to 12 hours light and 6 to 8 hours dark cycle. Indoor air temperature for the chicks will be maintained at 36°C. The birds was divided into six treatment groups including the control group and birds were fed *ad-libitum* with the control and experimental diets for each treatment group. Battery cage system was used

Experimental Diets

A total of six experimental diets was formulated and fed as recommended by Dafwang, (2006) for this study to contain 23% CP and 2839kcal/kg of M.E respectively as shown in table 2. Diet 1 was the control group without inclusion level of DSOPM while diets 2, 3, 4, 5 and 6 had inclusion levels of DSOPM at 2.5%, 5%, 7.5%, 10% and 12.5% respectively.

Table 1 Experimental Diets

INGREDIENT	1	2	3	4	5	6
Maize	53.10	50.60	48.10	45.45	42.72	39.95
DSOPM	0.00	2.50	5.00	7.50	10.00	12.50
GNC	26.10	26.10	26.10	26.25	26.50	26.75
Soyabean Cake	10.00`	10.00	10.00	10.00	10.00	10.00
Fish Meal	3.50	3.50	3.50	3.50	3.50	3.50
Rice Offal	2.70	2.70	2.70	2.70	2.70	2.70
Lime Stone	0.50	0.50	0.50	0.50	0.50	0.50
Bone Meal	3.00	3.00	3.00	3.00	3.00	3.00
Lysine	0.30	0.30	0.30	0.30	0.30	0.30
Methionine	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.30	0.30	0.30	0.30	0.30	0.30
Vitamin Premix	0.25	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00	100.00



Data Collection

Data was collected on feed intake and weight gain. The primary data (Feed Intake and Weight Gain), was used to calculate feed conversion ratio. Initial live weight and final live weight was recorded at the onset and end of the experiment, respectively.

Statistical Analysis

Data collected on performance parameters was subjected to General Linear Model (GLM) procedure of SAS (2001) for analysis of variance (ANOVA). Significant differences among treatment means was separated using the Duncan's Multiple Range Test (Duncan, 1955) Means was considered different at $P < 0.05$.

RESULTS

Productive performance of Quail fed graded level of DSOPM

The productive performance of Japanese quails fed diets containing Dried sweet orange Peel meal is presented in Table 2. The results of this study revealed that there was no significant ($P > 0.05$) difference in the mean initial body weight but in parameters such as the mean final body weight, mean body weight gain and feed conversion ratio, the result revealed significant ($P < 0.05$) difference and this was also observed for feed intake of quail birds fed the experimental diets. The results of the present study revealed that feed intake of Japanese quail was significantly affected by the inclusion levels of DSOPM. The lowest feed conversion ratio of the control showed that this diet was better than DSOPM based diets. Among DSOPM based diets, diets 2-5 (2.5 – 10%) had similar values of feed conversion ratio which were significantly better than diet 6.

Table 4.2 Productive performance of Quail fed graded level of DSOPM

Parameters	Inclusion Levels of DSOPM						SEM
	0%	2.5%	5.0%	7.5%	10%	12.5%	
	T1	T2	T3	T4	T5	T6	
Mean Initial body Weight (g/bird)	52.93 ^a	53.13 ^a	53.12 ^a	52.92 ^a	53.64 ^a	52.92 ^a	0.911
Mean final body Weight (g/bird)	146.79 ^c	129.86 ^b	117.70 ^{ab}	122.37 ^{ab}	111.37 ^a	111.60 ^a	0.167
Total Feed Intake (g/bird)	468.05	470.17	513.80	464.18	433.25	436.85	
Mean body Weight Gain (g/bird)	93.86 ^b	76.73 ^a	64.58 ^a	69.45 ^a	57.73 ^a	57.68 ^a	0.283
Feed conversion ratio	4.99 ^c	6.13 ^{bc}	7.46 ^a	6.68 ^{ab}	7.50 ^a	7.75 ^a	0.079

Means having the same superscripts in the same row do not differ significantly ($p > 0.05$)

DISCUSSION

There was significantly higher final weight and weight gain observed in birds fed the control diet T1, as compared to other diets DSOPM T2, T3, T4, T5 and T6 (Dried Sweet Orange Peel Meal) and the observable weight gain could be due to good nutrient utilization traceable to effectiveness of processing by drying and grinding of the orange peel. This result is in agreement with the report of Omeje (1999) and Kaankuka *et al.* (2000) who reported that processing improves the utilization of proteins and energy contained in fruits.

The feed intake of Japanese quail which was significantly affected by the inclusion levels of DSOPM was in agreement of what was reported by Edache *et al.*, (2005), when they fed graded levels of yam peels to quail. They reported significant ($p < 0.05$) differences in feed intake in quails fed diets containing yam peel meal compared to the control. However, the aforementioned results



agree with those of Adesiji *et al.*, (2012) who reported no significant difference for Japanese quails fed graded levels of *Detarium microcarpum* seed meal based diets.

The feed conversion ratio diets 2-6 (2.5 – 12.5%) which had similar values of feed conversion ratio was due to the fact that increase in inclusion level of DSOPM increased the fiber level of the diet. Therefore, Japanese quails could not utilize above 5% DSOPM effectively as earlier reported by Florou-Paneri *et al.*, (2001) that using up to 6% dried citrus Peel in laying quails diets had no significant adverse effect on performance. Increase in the inclusion level of DSOPM had effects on the utilization of the diets by reducing absorption of nutrients. The observation on the FCR is also in line with the findings of Gebhart and Kabanov (2001) who reported that better feed conversion ratio signified that more feed was retained in the animals and less waste to the environment.

Conclusion

Collectively, the performance of birds on inclusion diets of 0.5% - 10% Dried Sweet Orange Peel Meal (DSOPM) was similar but lower, compared with the higher values in the control diet, but hence, can adequately replace maize in quail nutrition at this level without any negative effect on growth performance. the study recommends that since the performance response of the birds at 0.5-10% inclusion level were statistically similar but lower than the control diet, it is recommended that 10 – 15% inclusion may be considered since adult unsexed quails fed with the diets had an average weight that fell within the recommended average weight of 100 – 140g (adult male) and 120 – 160g (adult female) as reported by Randall and Bolla (2008)

REFERENCE

- Adeniji, A. A. and Jimoh, A. (2007). Effects of Replacing Maize with Enzyme-Supplemented Bovine Rumen Content in the Diets of Pullet Chicks. *International Journal of Poultry Science*. 6(11): 814-817.
- Adesiji, M. A., Ijaiya, A. T., Aremu, A., Jiya, E. Z., Egena, S. S. A., Shittu, A. and Ladon, J. N. (2012). Growth Performance, Nutrient Digestibility and Carcass Characteristics of Japanese Quails Fed Graded Levels of Cooked Tallow (*Detarium microcarpum*) Seed Meal. *Savannah Journal of Agriculture* Volume 7(1) 65- 69.
- (Citrus sinensis) fruit peel as a feed resource in broiler production. *Int. J. Poult. Sci.*, 9(7): 684-688.
- Agwunobi, L. N. and Ina-Ibor, O. B. (2007). Processed rubber seed meal in the diets of growing Japanese quails (*Coturnix coturnix japonica*). *Proceedings of the 32nd Annual Conference of the Nigerian Society for Animal Production*, 18th-21st March. Calabar, Cross River state, Nigeria. Pages 380-382.
- Angulo, J., Mahecham, L., Yepes, S.A and Yepes A.M. and Gallo, J. (2012). Quantitative and nutritional characterization of fruit and vegetable waste from marketplace: a potential use as bovine feedstuff. *J. Environ. Manage.* 95:S203–S209.
- Bamgbose, A. M., Ogungbenro, S. D., Obasohan, E. E., Aruna, M. B., Oteku I. T., Igene, U. F., Otoikhian, C. S. O. And J. A. Imasuen (2004). Replacement value of maize in offal / cashew nut for maize in broiler diet. *Proceedings of the 29 th Annual conference othe Nigerian society for Animal Production*. 29; 219 – 221.
- Dafwang, I. I. (2006). Nutrient Requirement and Feeding Regimen in Quail Production. A paper presented at national workshop on quail production for sustainable household protein intake (NAERLS), Ahmadu Bello University Zaria September 11-13. PP. 12-19.



- El Sayed, S. A., El-Kholy, M. Eleraky, W. A. and Soliman, M H. (2010). Effect of partial replacement of yellow corn with dried Citrus Peel in Nile tilapia diets on growth performance, nutrient digestibility and immune status. Engormix.com, 25/10/2010.
- Esonu, B. O., Azubuike, J. C., Emenalom, O. O., Etuk, E. B., Okoli, I. C., Ukwu, H. D. and Nneji, C. S. (2004). Effect of enzyme supplementation on the performance of broiler finisher fed *Microdesmis Puberula* leaf meal. *International Journal of Poultry Science*, 3:112-114.
- Esonu, B.O., Iheukwumere, F.C. Emenalom, O.O. Uchegbu M.C. and Etuk, E.B. (2002). Performance Nutrient Utilization and Organ Characteristics of broiler finisher fed *MicrodesmisPuberula* leaf meal. *Livest. Res. Rural Dev.*, 14: 1.
- Esonu, B.O., Iheukwumere, F.C. Iwuji, T.C. Akanu N. and Nwugo, O.H. (2001). Evaluation of *MicrodesmisPuberula* leaf meal as feed ingredient in broiler starter diets. *Nig. J. Anim. Prod.*, 30: 3-9.
- Florou-Paneri, P., Babidis, V., Kufidis, D., Christaki, E. and Spais, A. B. (2001). Effect of feeding dried citrus Peel on quail laying performance and some egg quality characteristics. *Arch. Geflugelk.*, 65:178-181.
- Mourão, J. L., Pinheiro, V.M., Prates, J.M., Bessa, R.J.B., Ferreira, L.M., Fontes, C.M.G. and Ponte P.I. (2008). Effect of dietary dehydrated pasture and citrus Peel on the performance and meat quality of broiler chickens, *Poult.Sci.*, 87(4), 733–43.
- Odbanjo, O.O. and Sangodoyin, A.Y. (2002). An improved understanding of current agricultural and industrial waste management techniques in southwestern Nigeria using field evidence. *J. Urban Environ. Res.* 3(1): 67-75.
- Oluremi O.I.A., Ojighen V.O. and Ejembi E.H.(2006). The nutritive potentials of sweet orange (*Citrus sinensis*) rind in broiler production, *Int. J. Poult. Sci.*, 5, 613-617.
- Oluremi, O. I. A., Ojighen, V. O., Ejembi, E. H. (2006). The nutritive potentials of Sweet orange (*Citrus sinensis*) rind in broiler production. *Int. J. Poult. Sci.*, 5(7):613-617.
- Oluremi, O. I. A., Andrew, I. A. and Ngi, J. (2007). Evaluation of the Nutritive Potential of the Peels of Some Citrus Fruit Varieties as Feeding stuffs in Livestock Production. *Pakistan Journal of Nutrition* 6 (6): 653- 656.
- Randall M. and Bolla G. (2008). Raising Japanese quail. 2nd edition. Shim, K. F. and Vohra, P. (1984). A review of the nutrition of Japanese quail. *World's Poult. Sci.*, 261-275.
- SAS (Statistical Analysis System) (2001) SAS User's guide: Version 6.11 SAS Institute Inc. Cary. North California USA
- SPSS (2007). Statistical package for Social Science. Release 17.0. User Manual. Microsoft Corp; U.S.A.
- Stashenko, E.E., Martinez, R., Pinzdn, M.H. and Ramfrez, J. (1996). Changes in chemical composition of catalytically hydrogenated orange oil (*Citrus sinensis*), *J. Chromat.* 752: 217-222.