ISSN 1682-8356
ansinet.org/ijps

INTERNATIONAL JOURNAL OF POULTRY SCIENCE

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorijps@gmail.com

International Journal of Poultry Science 5 (1): 43-46, 2006
ISSN 1682-8356

Palm Oil and Animal Fats for Increasing Dietary Energy in Rearing Pullets

M.A. Isika[1], E.A. Agiang[2] and B.I. Okon[2]
[1]Department of Animal Production and Health, Faculty of Agriculture, P O Luyengo Campus, University of Swaziland, Swaziland
[2]Department of Animal Science, Faculty of Agriculture, University of Calabar, Calabar, Nigeria

Abstract: A total of 300 *Nera* chicks at 8 weeks of age were randomized into five experimental rearing diets containing 170g/kg crude protein and 2800Kcal/kg of metabolizable energy to determine the comparative advantage of palm oil and animal fat as sources of increasing dietary energy in pullets. Five diets were supplemented with 2.5% and 5.0% palm oil or broiler offal fat at the expense of maize. Birds on diets with palm oil tended to retard attainment of sexual maturity, but egg production was significantly ($P<0.05$) increased at 5% broiler offal fat or palm oil, and the latter additionally resulted in higher egg mass. It is concluded that 5% broiler offal fat or palm oil comparably promoted higher egg production; the latter also supported heavier egg mass of the domestic fowl. Broiler offal fat holds great potential as energy source in pullets rearing.

Key words: Broiler fats, dietary energy, palm oil, pullets, sexual maturity

Introduction

Skilful pullets rearing, notably including dietary and lighting regimes is necessary for subsequent profitable egg production and egg qualities of domestic fowl. For instance, the onset, rate, timing of lay, shell quality, egg size and feed efficiency of layers (Leeson and Summers, 1980; Lewis *at al.,* 1992; and Etches, 1993) can be optimised by providing appropriate photo- and scoto-periodism. Investigations on nutrient requirements of poultry have been synthesized into an industrial system and feed formulation to optimize profitability of the biological potential of the modern strains of poultry (NRC, 1984; Fisher and Boorman, 1986; Cole and Haresign, 1989; Leeson and Summers, 1991). In the tropics, the emphasis in pullet rearing has always been on the dietary regimes with little or no consideration to lighting as poultry houses are usually open-sided and day-length comparatively constant.

The recommended dietary crude protein and metabolizable energy for the tropics are 170g/kg and 3000Kcal/kg respectively (NRC, 1976; 1984). But the supportive empirical evidence of the recommendations in Nigeria is scanty and there is a need to update information to match the consistent improvement in the genotype of the modern poultry birds. In the case of broilers for example, it is recommended that the required dietary energy is 3000Kcal/kg (Olomu, 1984) but a higher dietary energy was indicated by Oluyemi and Okunuga, (1975) who used palm oil to boost the dietary energy. However, palm oil or even maize as major sources of energy are of high demand in human diets especially in the resource- poor rural communities. Palm oil is also used in soap, cosmetics and paint industries. Furthermore, there are more efficient strains of poultry today evolved through advanced genetics engineering and nutrition (FAO, 2004) which also utilizes palm oil or other conventional energy sources. Therefore, if additional evidence (Isika *et al.*, 1999, Isika *et al.*, 2001) supports augmenting the dietary energy of growers as it appeared to be the case with broiler chicks, cost effectiveness could be enhanced if a suitable substitute is available for palm oil as a dietary energy booster.

The current study was therefore undertaken to determine the energy requirement in rearing pullets in South-Western Nigeria, through comparing palm oil and broiler offal fat as dietary energy sources.

Materials and Methods

The experimental *Nera* strain of birds are the chicks of a commercial stock popular in south western Nigeria, where the study was conducted and when the average temperature and relative humidity were 31^{o}C and 65%, respectively while the day length averaged 12.1 hours (University of Ibadan meteorological station, 2004).

The birds were initially reared on deep litter system to 8 weeks of age on a commercial starter diet, containing 220g/kg crude protein and 3000Kcal/kg of metabolizable energy. A total of 300 pullets were randomly picked from the flock and randomized into triplicate pens of five experimental diets. The grower diets were formulated to contain 2.5% and 5.0% palm oil or broiler offal fat, respectively with one diet (0.0%) as the control (Table 1). All diets had approximately 175g/kg crude protein and 2800Kcal/kg of metabolizable energy. Feeding was *ad libitum* and management of pullets in the tropics according to the methods of Oluyemi and Roberts (2001) was adopted. Routine vaccinations were given on schedule.

Table 1: Gross Experimental grower diets

Ingredients, g/kg	Palm Oil			Broiler Fat	
PO/BF inclusion (%)	0.0	2.5	5.0	2.5	5.0
Maize	442	417	392	417	392
Palm Oil	-	25	50	-	-
Broiler fat	-	-	-	25	50
Fixed Ingredients[1]	558	558	558	558	558
Calculated:					
Crude protein	175	174	175	174	175
Net energy (Kcal/kg)	2820	2813	2809	2804	2829
Determined (% DM)					
Crude protein	174	175	175	175	175
Ether extract	51	50	52	50	52
Crude fibre	61	61	60	61	61
Met. Energy (Kcal/kg)	2803	2806	2820	2812	2831

PO-Palm Oil, BF-Broiler Fat. [1]Common ingredients consisting of (g/kg): Groundnut cake 110; Wheat offal, 260; palm kernel cake, 150; Oyster shell, 20; Bone Meal, 10; Salt, 3; Premix* 5. *As recommended by manufacturers (Pfizer).

Table 2: Performance of the domestic fowl on different dietary rearing regimes.

Ingredients	Palm Oil			Broil Fat	
PO/BF inclusion (%)	0.0	2.5	5.0	2.5	5.0
a. Ages: Week (days)					
I. At 1st egg	18 (3)^{b}	18 (6)^{b}	19 (1)^{a}	19 (3)^{a}	18 (0)^{b}
ii. At Peak	32.1^{a}	30.4^{b}	28.0^{c}	31.2^{a}	27.6^{c}
b. Egg production (%)					
I. At Peak	74.3^{b}	83.4^{a}	77.9^{ab}	82.6^{a}	75.1^{b}
ii. Hen-house	67.8^{c}	70.5^{ab}	73.3^{a}	67.3^{c}	71.2^{a}
c. Feed intake/bird/kg					
I. 9 – 21 week	5.8	5.6	5.9	5.8	6.1
ii. Per day after 21 wk (g)	12.9^{a}	128.1^{ab}	126.1^{ab}	123.4^{c}	125.5^{b}
iii. Feed conversion rate after 12 wk	3.1	3.0	3.1	3.2	3.1
d. Egg qualities					
I. Size (g/egg)	50.4^{b}	51.3^{b}	57.1^{a}	54.0^{b}	53.1^{b}
ii. Shell thickness(mm)	0.34	0.33	0.34	0.333	0.32
e. Mortality (number of birds)					
I. 9 - 21 wk	1	-	-	1	-
ii. 21 – 45 wk	3	1	-	1	1

Figures on the same horizontal line differently superscripted are significantly different at 5% level. PO = Palm Oil, BF = Broiler Fat

At 22 weeks of age of the birds, the experimental diets were replaced with commercial layers diet containing 150g/kg crude protein and 2700Kcal/kg of metabolizable energy. Proximate composition of the experimental diets was determined using official methods of analysis (AOAC, 1990). Data collected consisted of age at maturity, feed intake, peak production, mortality, egg quality and early performance as layers.

The data were subjected to one-way analysis of variance (ANOVA) followed by separation of statistically different means using Duncan multiple range test (Steel and Torrie, 1980).

Results

The rearing and laying performance result of the experimental pullets are summarized in Table 2 which indicated a faster ($P<0.05$) attainment of maturity of the layers on diets containing 5% broiler offal fat, than the palm oil. The age of attaining peak egg production followed the same pattern as that of the first egg. However, the hen day production peak was significantly ($P<0.05$) inferior in birds fed the 2.5% palm oil or broiler offal fat than for the 5% broiler fat and control diets, though not with the 5% palm oil.

In terms of hen-housed production, the 5% palm oil and broiler fat diets were each significantly ($P<0.05$) superior to the control diet, but not the 2.5% broiler fat. The egg-size of the birds on 5% palm oil was significantly ($P<0.05$) higher than those of the 5% broiler fat. Shell thickness was not significantly ($P>0.05$) affected by the dietary treatments. Feed consumption from 9-21 weeks of age of the birds was between 5.6 to 6.1kg being statistically (p>0.05) unaffected by dietary fats. The feed consumption per day from the 21st week was significantly (P<0.05) higher for the control diet than for the diets with broiler offal fat, but statistically (P>0.05) the same for those with palm oil

Discussion

Higher dietary energy hastens attainment of sexual maturity (Leeson, 2001) which supports the observations in this study. The result further agrees with Yu *et al*. (1992) who asserted that restricting calorie and or protein intake before maturity delays the onset of egg production. The limit to which the birds could tolerate fat inclusion in diets is perhaps through the provision of fat soluble vitamins which occur in abundance in palm oil as asserted by Oluyemi and Oyenuga (1973).

The observed hen house production suggested that the energy sources in broiler fat and palm oil could be optimized beyond 5% level inclusion as contained in this study, even though it appeared contradictory to what was obtained for peak production. Some authors asserted that when the energy requirements for maintenance activity and egg production (Scragg *at al*., 1987) are provided by non-protein sources in the diet, protein intake of the hen will influence the egg size (Noble, 1987; Etches, 1993). The concept contends that as methionine consumption affect egg-size and is the first limiting amino acid especially in plant protein, increasing the protein content of the diet primarily increased the disposition of albumin, while linoleic acid elevates the yolk formation. The superior egg size in this study supports the earlier result that provision of polyunsaturated fatty acids in the palm oil (Oluyemi and Oyenuga, 1973; Oluyemi and Okunuga, 1975) has added impetus for egg size than the broiler fat diets. That is, in addition to providing more energy for production in broiler offal fat, palm oil further furnished unsaturated fatty acids which are required for increased egg-size.

Given that the diets containing 2.5% of either lipid on the one hand or 5.0% on the other were iso-energetic, it is uncertain why diets with broiler offal fat were significantly (P<0.05) lesser consumed. A possible reason could be the unpalatable broiler offal fat that was probably processed along with the bile content which could impact a bitter taste on the diets. Invariably, as the daily intake of specific nutrient components in the diet influenced egg mass, so too any situation that cause reduction in food consumption equally reduces egg size. The higher consumption of the palm oil containing diets might have contributed to a greater egg production. The palm oil and its available vitamins and unsaturated fatty acids may have accounted for the heavier eggs in layers which is agreement with report of Oluyemi and Oyenuga (1973). The post-mortem of dead birds showed symptoms of *Salmonella* and *E. coli* infections, but mortality indicated consistent causal pattern unrelated to the treatments

Conclusion: It is concluded that 5% inclusion level of broiler offal fat and palm oil in pullet diets comparably promoted higher egg production, while the latter also supported heavier egg mass of the domestic fowl. Both palm oil and broiler fat can be used for increasing dietary energy for pullets and where scarcity of energy sources is experienced broiler offal fat could be readily and inexpensively utilized in pullets rearing.

Acknowledgement

The authors are grateful to the management of Zartech poultry (Nig) Ltd., Ibadan, Nigeria for the animal fat obtained from the broiler processing unit and used in the study.

References

AOAC, 1990. Official methods of analysis (14th Ed.) Association of Official Analytical Chemists, Arlington, VA.

Cole, D.J.A. and W. Haresign, 1989. Recent Development in Poultry Nutrition. Butterworths, London.

Etches, R.J., 1993 Reproduction in Poultry. In: Reproduction in Domesticated Animals. Edited by G J King Elsevier, Amsterdam.

FAO, 2004. Protein sources for animal feed industry. Expert consultation and workshop. Bangkok, 29 April- 3 May 2002, p: 11-51.

Fisher, C. and K.N. Boorman, 1986 Nutrient requirement of poultry and nutritional research: British Poultry Science. Symposium 19, Butherworths, London.

Isika, M.A., J.A. Oluyemi and O.O. Mgbere, 1999. Processing and determination of nutrient composition of broiler offal meal. Global J. Pure Appl. Sci., 5: 15-20.

Isika, M.A., E.A. Agiang and B.I. Okon, 2001. Determination of the metabolizable energy of broiler offal fat. J. Appl. Sci. Edu., 4: 16-22.

Leeson, S. and J.D. Summers, 1980. Effect of early light treatment and diet self-selection on laying performance. Poult. Sci., 59: 11-15.

Leeson, S. and J.D. Summers, 1991 Commercial poultry nutrition, University Books, Guelph, Canada.

Leeson, S., 2001. Feeding programmes for egg-strain pullets up to maturity. ASA Technical Bulletin, Vol. P050-2001.

Lewis, P.D., G.C. Perry, T.R. Morris and M.M. Midgley, 1992. Intermittent lighting regime and mortality rates in laying hens. World's Poult. Sci. J., 48: 113-120.

Noble, R.C., 1987, Egg Lipids. In Egg quality. Current problems in Recent advances. Edited by Wells R G and Beyavin C G Butherwordths, London.

N.R.C., 1976. Nutrient requirement of poultry. (8^{th} edition) National Academy Press, Washington, D C.

N.R.C., 1984 Nutrient requirement of poultry. (8^{th} edition) National Academy Press, Washington, D C.

Olomu, J.M., 1984. Protein and energy nutrition of poultry in Nigeria. In Breeds and nutrition of poultry in Nigeria. World Poultry Science Association, p: 45-58.

Oluyemi, J.A. and V.A. Oyenuga, 1973. Effect of varying dietary levels by supplementation with palm oil on started chicks. West Afr. J. Bio. Appl. Chem., 16: 18-22.

Oluyemi, J.A. and K.O. Okunuga, 1975. Effect of dietary palm oil and energy on the performance of white rock breeders in Nigeria. Poult. Sci., 54: 305-310.

Oluyemi, J.A. and F.A. Roberts, 2001. Poultry Production in Warm Wet Climates. Macmillan Press Ltd. (4th Edition). London and Basingstoke.

Scragg, R.H., N.B. Logan and N. Geddes, 1987. Response of egg weights to the inclusion of various fats in layer diets. Br. Poult. Sci., 28: 15-21.

Steel, R.O.G. and J.H. Torrie, 1980. Principles and Procedures of Statistics. A biometrical approach. Students edition. McGraw-Hill Int. Books Co. London.

Yu, M.W., F.E. Robinson and A.R. Robblee, 1992. Effect of feed allowance during rearing and breeding on female broiler breeders. Growth and carcass characteristics. Poult. Sci., 71: 1739-1749.