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GROWTH, LAYING PERFORMANCE AND EGG QUALITY TRAITS OF "NAPRI COMMERCIAL LAYERS" ON DEEP LITTER AND IN CAGES

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Target audience: Poultry farmers, breeders, researchers and teachers.

ABSTRACT

This study was conducted to assess the growth, laying performance and egg quality traits of a commercial layer strain developed by the National Animal Production Research Institute (N.A.P.R.I.), Ahmadu Bello University, Zaria. The birds were reared on deep litter to point of lay after which some were transferred to cages while allowing the rest to continue on deep litter for the laying phase. The birds were fed a commercial layers' mash ad libitum. The results showed a high prelaying growth rate and body weight (1382 g) at sexual maturity, early sexual maturity (132 d) and relatively lower rearing mortality (1.35 %). The feed intake of the birds and feed conversion (feed:gain) were low when compared with what obtained in other commercial layers. Comparison of results of egg production rate, egg weight, feed efficiency (feed/dozen eggs) and laying house mortality of "NAPRI Commercial Layers" on deep litter and in cages showed the superiority of cage over deep litter housing systems. There was no significant difference in terms of egg quality traits (shell thickness, yolk index and Haugh unit) between the two housing systems. "NAPRI Commercial Layers" compared favourably well with other commercial layers in all the parameters monitored.

Key words: NAPRI commercial layers; growth; laying performance; egg quality; housing systems.

DESCRIPTION OF PROBLEM

In an attempt to improve the quality and quantity of poultry products that get to the consumer, a lot of money (foreign reserve) has been spent on the importation of parent stock and hatching eggs of exotic chickens by the poultry industry in Nigeria. This is because the breeder farms have to renew their stock through importation on a regular basis. This dependence on foreign stock is associated with problems of low performance of imported exotic chickens in the tropics when compared with their performance in the temperate region of origin because of poor acclimatisation (1). Besides, the foreign breeders may not want to make readily available birds with outstanding performance (2). Foreign strains may become a source of poultry diseases foreign to Nigeria because there is no disease control measure at the ports of entry and above all, there is loss of foreign reserve to the nation.

Considering the above problems associated with the importation of exotic fowls, there is the need to develop poultry species within the country that will stop the frequent importation of parent/grand parent chicks and the accompanying hazards. More importantly, livestock species should be developed in the environment which they are meant for in order to remove the adverse effect of genotype-environment interaction. Consequently, the National Animal Production Research Institute (N.A.P.R.I.), Ahmadu Bello University, Zaria in Nigeria imported two lines of grand parent stock and maintained both male and female lines for each strain from which gene pool and egg production traits is being developed. The stocks are being tested in various ecological zones in the country of which Ilorin is a centre. This study was therefore designed to assess the growth, laying performance and egg quality traits of "NAPRI commercial layers" when kept on deep litter or in cages in the middle belt ecological zone of Nigeria.

MATERIALS AND METHODS

A total of 237 day-old chicks were supplied by NAPRI. The chicks were brooded on deep litter from 0 - 8 weeks of age, during which they were fed with a commercial chick mash containing 19 % crude protein, 4.8 % crude fat, 1.1 % crude fibre and 6.3 % total ash. They were also fed a commercial growers' mash from 9 - 18 weeks of age. The growers' mash contained 14.5 % crude protein, 4.8 % crude fat, 7.2 % crude fibre and 8 % total ash. After this age, 120 birds were randomly assigned to two birds/cage while the rest of the birds were left on deep litter. A commercial layers' mash, containing 16.5 % crude protein, 4.0 % crude fat, 5.0 % crude fibre and 12.9 % total ash, and water were supplied ad libitum and all necessary vaccination programmes were carried out.

Data collection and statistical analyses : Weekly body weight gain and feed intake were measured, from which feed conversion (feed:gain ratio) was computed and rearing mortality was determined from 0 to 20 weeks of age. Age, body weight and average egg weight at first egg and age at peak of egg production (age at highest egg production) were taken. For both birds in cages and on deep litter, feed intake for the laying period and egg production efficiency defined as grams of feed required to produce a dozen eggs were determined.

Weekly egg weight, hen housed and hen day rates of lay (computed from egg production records) were determined for each group. Laying house mortality was also determined. At 52 weeks of age, egg quality traits (egg weight (g), shell thickness (mm), yolk index and Haugh unit) were measured. Performance of the birds was described using descriptive statistics and other data collected were subjected to Students' 't' test (3).

RESULTS AND DISCUSSION

Body weight increased during the rearing period from 32.88 g to 1,445.45 g between 0 and 20 weeks of age (Figure 1). By the sixth week of age the birds' weight had increased about ten times. This increase is higher than the 3 - 5 times reported by Oluyemi and Roberts (4) for the same period in Rhode Island Red. The birds maximised their body weight between 8 and

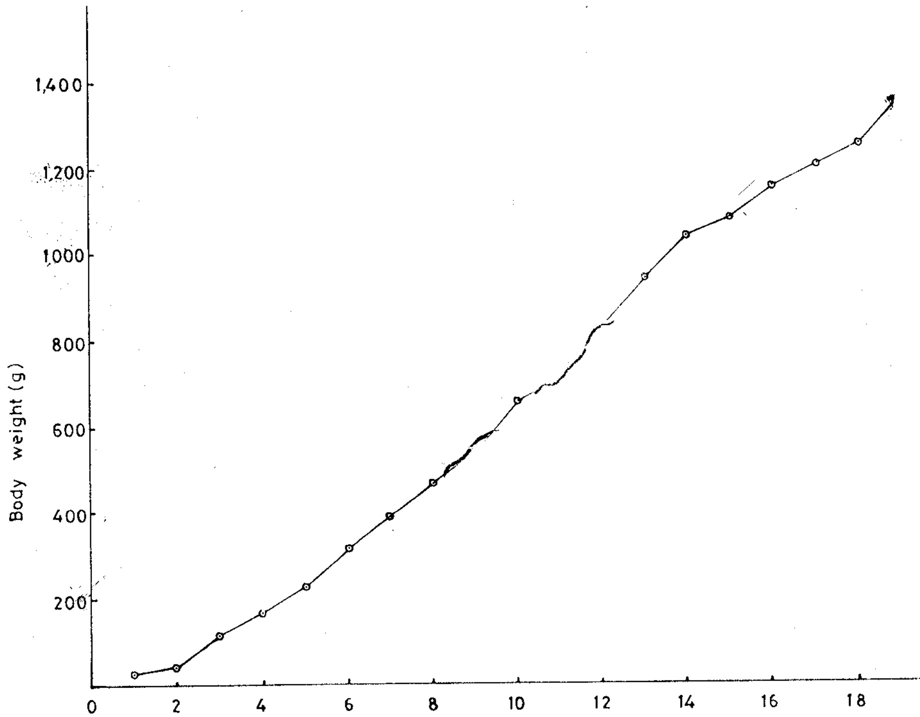

Fig 1 Growth performance (Mean body weight) of Birds

12 weeks of age after which they entered the decelerative growth phase as a consequence of the onset of puberty. This agrees with the findings of Roberts (5). Highest weight gain in this study was at 12 weeks of age. The decrease in body weight gain during the early week of laying which was also observed in Harco layers (6) may be due to the diversion of nutrients from body weight gains to egg production after meeting maintenance requirements, once mature body weight has been attained (7). The body weight of 1,382.70 g at sexual maturity was comparable with similar commercial layers raised under similar environmental conditions (4, 6, 7, 12).

Weekly feed intake increased with the age of birds. Feed intake of *ad libitum*-fed Black Olympian birds also increased during the period (7). Feed conversion ratio for the birds increased up to 20 weeks of age which indicate that efficiency of feed conversion decreased with age (Table 1). In comparison with the 9.39 obtained for Black Olympian birds (7), the NAPRI birds were more economical in terms of reduced feed cost.

Table1: Prelaying Feed Intake, Weight gain, Feed conversion and Mortality of "N.A.P.R.I. Commercial Layers"

Parameters	Period (Weeks)	
	1-8	9-18
Cumulative Feed Intake (g)	1741.23	6977.18
Cumulative Weight Gain (g)	445.85	784.02
Feed Conversion (feed: gain)	3.91	8.90
Rearing Mortality (%)	0.90	0.45

Prelaying mortality of the birds was very low (1.35 %). This value is lower than the 2.78 % obtained for high body weight *ad libitum*-fed Black Olympian (7) reared under the same conditions.

The age at first egg (132 days) was the same for both deep litter and caged birds (Table 2). The implication of this low age at sexual maturity is reduced amount of feed cost per egg. This age at first egg is lower than the 151 days obtained for Black Olympian birds (7). The birds were also able to maintain a high laying persistency to 72 weeks of age.

Table 2: Production Performance of Pullets and Hens as Influenced by Housing System

Parameters	Housing System	
	Floor	Cage
Age at First Egg (days)	132	132
Body Weight at First Egg (g)	1382.27	1382.27
Average Weight of First Egg (g)	41.33	41.24
Feed Conversion (feed: gain) at first Egg	7.47	7.47
Age at Peak Egg Production (weeks)	30	28
Laying House Mortality (%)	10.32	8.45

Figure 2 shows the weekly egg weight for deep litter and caged birus. Egg weight for both groups of birds increased between 20 and 44 weeks of age. This agrees with the report of Cunningham et al. (8) that egg weight increased between 2 -7 months of lay. The increase in egg weight had been

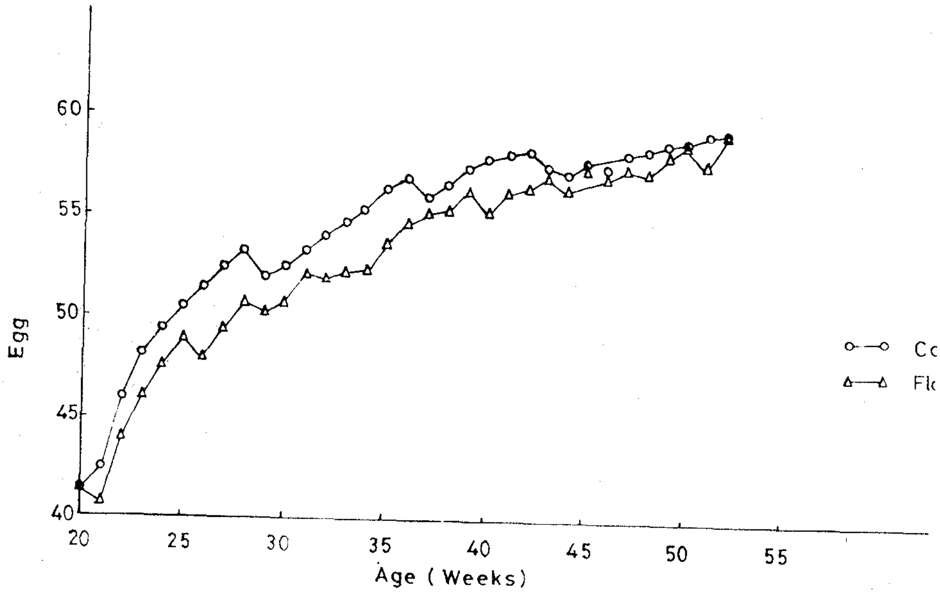

Fig 2 Mean egg weight for layers in deep litter and in cages .

reported to be as a result of increase in magnum size as birds increase in age (9). There was a significant ($P < 0.05$) difference between the increase in egg weight of birds on deep litter and in cage except at 20-24 weeks of age and 49-52 weeks of age. Eggs from caged birds were significantly ($P < 0.05$) heavier than eggs from deep litter birds. This conforms with the findings of Wegner (10).

Figure 3 gives the value of weekly hen day egg production for both deep litter and caged birds. Caged birds had higher ($P < 0.05$) hen day egg production between 25 and 37 weeks of age. No significant difference was observed in the other age groups. Peak egg production was attained at 30 weeks of age for the deep litter and 28 weeks of age for the caged birds. These ages correspond to the 28-31 weeks of age reported for high body weight, low body weight, *ad libitum* and restricted fed Black Olympian birds (7).

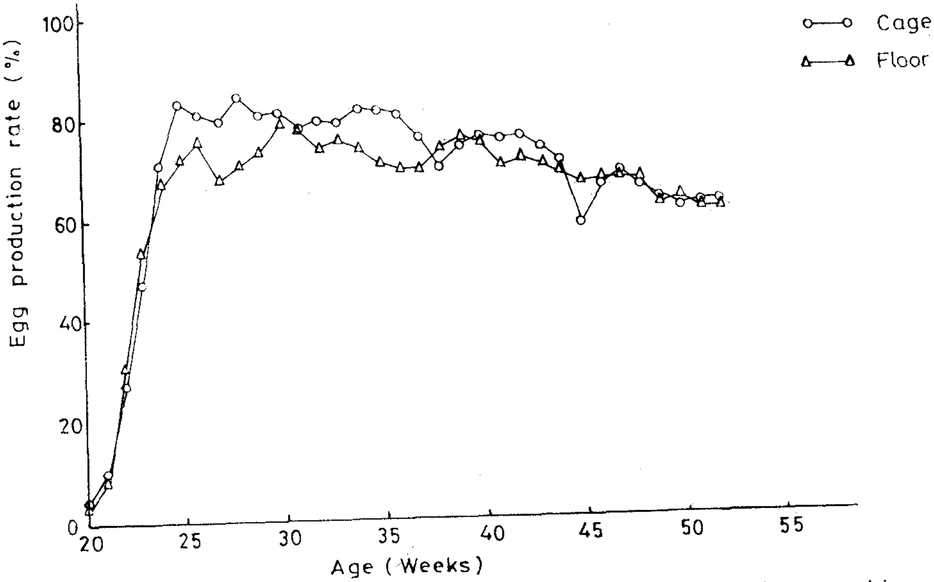

Fig 3 Henday egg production for layers on deep litter and in cages

Feed efficiency (the amount of feed needed for the production of a dozen eggs) for both deep litter and caged birds are shown in Figure 4. Caged

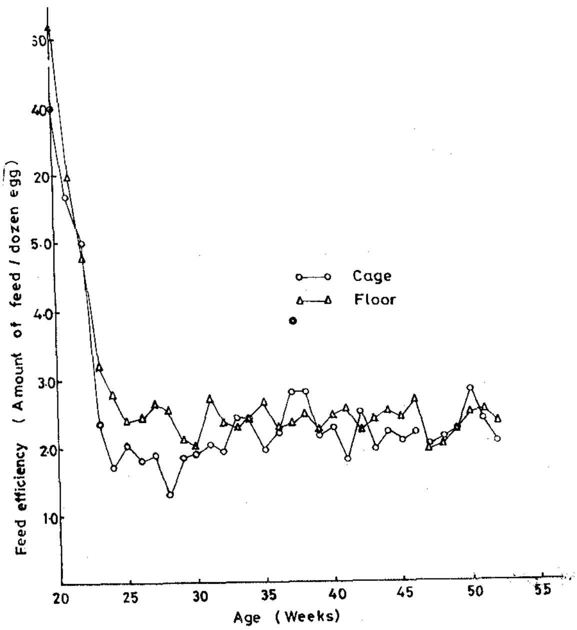

Fig. 4: Egg production efficiency for layers on deep litter and in cages.

birds were better than deep litter birds in feed efficiency from 24 to 32 weeks of age after which there was no apparent significant difference. Feed efficiency of caged birds was better than deep litter birds on weekly basis, although the overall mean value showed no significant difference between the two housing systems. This observation agrees with the report of Miller and Quisenberry (11) and Wegner (10) that caged birds were better than deep litter birds in terms of feed efficiency. This effect may be due to physical restriction of caged birds which limits wasteful dissipation of energy in moving about therefore making more of it available for productive functions (12), although Deportal (13) found no difference between the two systems of housing in egg production of domestic fowl under tropical conditions.

The overall laying house mortality was higher in the deep litter birds (10.38 %) than in the caged birds (8.45 %). These findings conform with the suggestion of Wegner (10) that higher mortality in deep litter may be due to increased contact between birds and their litters which is a favourable medium for the growth of disease causing organisms.

The result of this study indicates higher value of shell thickness for deep litter birds' eggs (Table 3) although the result was not statistically significant. High egg production rate leads to shell thickness (14) because same amount of egg shell is deposited on eggs irrespective of the size,

Table 3: Egg Quality at 52 Weeks of Age

Parameters	Housing System	
	Floor	Cage
Egg Weight (g)	59.40	59.67
Shell Thickness (mm)	0.42	0.40
Yolk Index	0.42	0.44
Haugh Unit	79.57	83.47

therefore smaller eggs tend to have thicker shells than the larger ones (15). This might explain why eggs from deep litter had thicker shell since caged birds produced bigger and more eggs on the average than the deep litter birds. There was no significant difference in terms of yolk index and Haugh unit of eggs from deep litter and caged birds. The yolk index falls within the accepted range of 0.33 to 0.50 for fresh egg (16). The average Haugh unit value of 79.57 for deep litter and 83.49 for caged birds indicate a high quality egg, since high quality eggs generally have Haugh unit values of 70 or more while those of very inferior quality have values of less than 40 (17).

CONCLUSIONS AND APPLICATIONS

It is hereby concluded that

1. The results indicated a sigmoid growth pattern with an early fast growing period.

2. The strain had early sexual maturity with a relatively lower rearing and laying house mortality which probably indicates the 'hardiness' of the strain and higher adaptability to local environmental conditions.
3. The strain maintained a high egg production rate with an average hen day production of about 80 % during the first quarter of the laying cycle (i.e. 20-32 weeks of age).
4. It was observed that "NAPRI Commercial Layers" compare favourably well with other commercial layers presently being marketed in Nigeria

As for applications, parent chicks for production of commercial pullets for the Nigerian market will soon be obtainable from NAPRI while the results of this work indicated that the birds can be successfully raised either on deep litter or in cages without much difference in performance.

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