Journal of Animal &Plant Sciences, 2012. Vol.15, Issue 2: 2130-2134
Publication date 30/9/2012, http://www.m.elewa.org/JAPS; ISSN 2071-7024

Laying performance of five local hen phenotypes, in improved rearing conditions

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Keywords: Phenotype, egg, laying performance

1 SUMMARY

The laying performance was evaluated for 2 years on 5 free-range local hens. Their phenotypes were: the normal, the naked neck, the dwarf, the silky and the frizzle. These were allocated into a family of 6 hens and 1 cock in duplicate at research station. Laying cycle, number of laid eggs, egg weight, egg length and diameter, day-old chick weight and phenotype were the collected data. The egg characteristics results in terms of egg weight and egg diameter were not significantly different among the phenotypes (P<0.05). But on the other hand significantly (P-value) longer eggs were recorded with dwarf hens and naked neck. Frizzle hens laid significantly more eggs (135 eggs/year/hen) than normal hens (51 eggs/year/hen) and were the most precocious (149.1 ± 3.3 days) and significantly heavier at sexual maturity stage (1065.1 ± 42 g) than the other hens. The mean interval between consecutive laying periods was shorter with dwarf hens (21.2 ± 1.5 days), naked neck (21.8 ±1.7 days) and frizzle (22.4 ± 1.5 day). Significantly lower chick weight was recorded in silky phenotype compared to other phenotypes. Results indicated that, provision of better health care, better feeding and management helped the free-range hens to better express their genetic make-up. The phenotype effect herein observed on laying performance proved that the choice of hen phenotype will be a determinant in selection programs for free-range local hens laying performance improvement.

2 INTRODUCTION

Family poultry can be found in all developing countries and play a vital role in many poor rural and peri-urban households (Alexander et al., 2004; Alders and Pym, 2009). Family poultry is defined as any genetic stock, improved or unimproved, that is raised extensively or semi-intensively in relatively small numbers (usually less than 100 at any time) and small flock of poultry raised extensively or semi-intensively in peri-urban and urban areas (Sonaiya, 2007). The importance of rural or village chicken production in the life of rural communities in developing countries has been widely recognized (Spradbrow, 1990; Kitalyi, 1998 and Sonaiya, 2007). It is important to the rural household nutrition and poultry flocks are mostly owned by children and women who are regarded as the poorest component of rural communities. The improvement of the production will valuably contribute to the economic empowerment of the women. The increasingly frequent presence of drug residues in commercial poultry products (Mensah et al., 2011) resulting from the intensive use of antibiotics and anticoccidiastats is of growing concern for health-conscious consumers, who definitely prefer drug residue-free poultry products. Also the need to have an environmental-friendly poultry production

system is so much convincing arguments in favor of the promotion of free-range poultry production system. But this production system is characterized by low productivity (Gueye, 2000) and higher losses (Wilson et al., 1987; Gueye, 2002; Kyvsgaard et al., 2002).

Over the last two decades in Benin, there has been increasing interest by Government in collaboration with international development agencies to implement poultry productivity improvement project to promote and develop free-range poultry production in a global strategy of food security goal achievement and poverty alleviation in rural area. The improvement of free- range chicken productivity and survivability is of paramount importance as well for rural poor community economy building as for the availability and affordability of drug residue-free poultry product for health-conscious consumers. Previous studies showed that local chickens have a higher production potential than what is expressed under scavenging conditions (Oluyemi, 1998; Ndegwa et al., 2001). Also many other authors (Dafwang et al. 2010 et Ngo et al. 2011) have reported the presence of an important biodiversity in free-range local chicken population with huge morphological and disease-sensitivity variability. Host (1988) gave the list of some genes present in local fowl populations with remarkably significant phenotypic effect, such as: *dw* (dwarf), *Na* (naked neck), *F* (frizzle), *h* (silky), *K* (slow feathering), *id* (non-inhibitor), *Fm* (fibro-melanosis), *P* (peacomb), *O* (blue shell).

The current study highlighted the laying performance potential of 5 free-range local hen phenotypes: the normal, the naked neck, the dwarf, silky and frizzle in improved rearing conditions.

3 MATERIALS AND METHODS

3 1 Free-range hen management: The study was carried out at the Agricultural Institute Research station, for 2 years. Five free-range local hen phenotypes: the normal, the naked neck, the dwarf, the silky and frizzle feathered, allocated into Family of 6 hens and 1 cock in duplicate were housed and reared in the poultry pens of the institute. The birds were kept separately in the same improved rearing conditions in terms of feeding system and basic biosecurity measures which composed of vaccination against Newcastle disease, periodic deworming and free access to drinking water. Egg laying nests were provided for each phenotypic hen groups and fertile eggs were incubated in an electrical automatic incubator. Laying cycle was recorded as well as number of laid eggs, egg weight, egg length and diameter, day-old chick weight and phenotype.

Normal feathered

Naked neck

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Dwarf Frizzled feathered Silky feathered

3.2 Day old chick management up to sexual maturity: Day old chick was identified with numbered rings fixed on the right wing. Chicks were housed in wire-netting-floured starting pen under 22-h lighting and held at initially 27°C. Temperature was steadily adjusted to ensure the comfort of the birds. The chicks have free access to feed and drinking water. After 2 months of age the chicks were moved into separated pens and kept there, up to sexual maturity.

3.3 Statistical analysis: The descriptive (variance analysis) and inferential (F test) analysis applied to laying performance was made using the General Linear Model of SAS (version 9.2).

4 RESULTS

There was no significance difference in egg weight and egg diameter among the five hen phenotypes ($P>0.05$). But on the other hand, the naked neck (4.9 ± 0.2) and dwarf (4.9 ± 0.2) hens eggs were significantly longer than normal feathered (4.6 ± 0.1), silky (4.7 ± 0.1) and frizzled (4.8 ± 0.2) phenotype laid eggs ($P<0.05$).

Table 1: Laying performance of local hens (Mean + SEM)

Laying performance	Naked neck	Dwarf	Normal feathering	Silky	Frizzle
Egg weight (g)	$41.1^{a}\pm1.1$	$39.1^{a}\pm1.2$	$41.6^{a}\pm1.3$	$38.3^{a}\pm1$	$38.4^{a}\pm1$
Egg diameter (cm)	$3.7^{a}\pm0.7$	$3.7^{a}\pm0.2$	$3.5^{a}\pm0.0$	$3.7^{a}\pm0.1$	$3.7^{a}\pm0.2$
Egg length (cm)	$4.9^{a}\pm0.2$	$4.9^{a}\pm0.2$	$4.6^{b}\pm0.1$	$4.7^{b}\pm0.1$	$4.8^{b}\pm0.2$
Egg laid/Hen/Day	$0.31^{a}\pm0.2$	$0.33^{a}\pm0.3$	$0.14^{b}\pm0.1$	$0.28^{ab}\pm0.2$	$0.37^{a}\pm0.1$
I.B.C.L.P. (day)	$21.8^{a}\pm1.7$	$21.2^{a}\pm1.5$	$38.4^{b}\pm1.5$	$30.8^{c}\pm1.7$	$22.4^{a}\pm1.5$
Chick weight (g)	$29^{a}\pm1$	$26.9^{ab}\pm0.9$	$27.2^{ac}\pm0.6$	$24.9^{b}\pm0.6$	$26^{bc}.1\pm0.6$
Age at S.M. (day)	$209.2^{a}\pm3$	$201.1^{a}\pm3$	$247.5^{b}\pm3.1$	$191.8^{c}\pm3$	$149.1^{d}\pm3.3$
Weight at S.M. (g)	$994.4^{a}\pm42.9$	$651.4^{c}\pm43$	$839^{b}.4\pm42.7$	$779.7^{b}\pm46.3$	$1065^{a}.1\pm42$

(Values in the same line that not share the same superscript letter are significantly different ($P<0.05$)), **IBCLP**: Interval between Consecutive Laying Period, **FCR**: Feed Conversion Ratio, **SM**: Sexual Maturity, **SEM**: Standard Error of the Mean

Frizzle hen laid more eggs (135 eggs/year/hen) followed by the dwarf hen (120 eggs/year/hen) and the naked neck (113 eggs/year/hen). The normal feathered hen laid significantly less eggs (51 eggs/year/hen) than its other counterparts, ($P<0.05$). The frizzled hen was the most precocious (149.1 days) and was significantly heavier (1065.1 g) at sexual maturity ($P<0.05$) followed by naked neck (994.4 g) and normal feathered hen phenotype (839.4 g) which was the least precocious (247.5 days). The mean interval between consecutive laying periods was shorter ($P<0.05$) with dwarf hen (21.2 days), naked neck (21.8 days) and frizzle hen (22.4 days). It was 30 and 38 days for silky and normal feathered hen phenotypes respectively. Day-old chick weights were significantly higher in naked neck (29 ± 1 g) than silky (24.9 ± 0.6 g) and frizzle (26.1 ± 0.6 g) hen phenotypic groups ($P<0.05$).

5 DISCUSSIONS

The laying performance results obtained herein proved that there is an important unexpressed laying potential and genetic variability among the different local phenotypes in free-range rearing conditions. The average number of eggs laid per year by frizzle, naked neck and dwarf hens were largely above that obtained by Ngo et al. (2011) ,in a research station (67 per year per hen), with local Cameroonian free-range local hen with the difference that these hens incubated and naturally hatched theirs chicks. In traditionally rearing conditions the average number of laid eggs by local hen, range from 30 to 50 eggs per hen per year (Van Veluw, 1987; Bourzat et al., 1990; Aklobess, 1990; Abdou et al., 1992; Yongolo et al., 1996). The feeding system and biosecurity measures, suppression of natural brooding and keeping of chicks, in the current study, have considerably reduced the mean interval between consecutive laying periods. This interval was shorter with dwarf, naked neck and frizzled feathered hen phenotypes and consequently improved their laying performance. It was longer with the silky and normal feathered hens. According to Ngo et al. (2011), this interval is longer when the hen has to naturally hatch the chicks and keep them up to the weaning (52 days in minimum). The frizzled hen laid significantly more eggs than the normal feathered hen and was most precocious than the other hens with the best weight performance at sexual maturity age. Several studies demonstrated that in tropical rearing conditions characterized by higher temperature the naked neck and frizzled hens have better laying and growth performance compared to their other counterpart, the normal feathered hen (Mérat, 1990). Divergent results of laying performance were obtained with naked neck, frizzled, dwarf and normal feathered hen phenotypes in Kenya at research station (FAO, 2010). According to the results, the laying rates of dwarf hen (36%), naked neck (33%) and frizzled (27%) were higher than that of normal feathered hen (23%). This paralleled a previous results obtained by Yeasmin and Howlider (1998) with a dwarf deshi phenotype more productive (33.5% of laying rate) than the normal feathered deshi phenotype (24.7% of laying rate) still, at research station in Bangladesh. The laying rate obtained with the dwarf hen phenotype (33%) in the current study is much closer to that obtained by these authors. The improved rearing conditions effect was less effective on the normal feathered hen performance (14%) than on the other 4 phenotypes. The choice of the phenotype will therefore be determinative in selection programs for free-range local hen laying performance improvement. Other laying parameters such as egg weight, diameter were not significantly influenced by phenotype factor, consistent with the results of Yeasmin and Howlider (1998) who recorded no significant egg characteristic difference among deshi phenotypic hen groups. However the longer eggs were recorded in naked neck and dwarf phenotypes. The average day-old chick weight obtained paralleled that recorded by Ngo et al. (2011).

Free-range hen reproductive performance potential was well expressed in improved conditions. This improvement was variable among the studied different free-range hen phenotypes. The choice of the phenotype will therefore be determinative in selection programs for free-range local hen productivity improvement

6 ACKNOWLEDGMENT

Gratitude is expressed to the Benin Ministry of high Education and Scientific Research for the financial support as well as the Agricultural Research Center of Agonkanmmey, the Biological Research Laboratory and Poultry Research Laboratory and Zoo-Economy of Agronomic Science Faculty, for their logistic support.

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