

## RESEARCH NOTE

### EFFECTS OF AGE IN LAY AND EGG SIZE ON FERTILITY AND HATCHABILITY OF CHICKEN EGGS

*B. O. ASUQUO AND B. OKON*

Department of Animal Science

University of Calabar

Calabar.

Received 3 September, 1992 Accepted 11 December, 1992

The effects of age in lay and egg size on fertility and hatchability of chicken eggs were studied using eggs of Hyperco White Broiler breeder. Age range was 1-6 months and the egg sizes were small (37.5-44g) medium (45-50g) and large (51-56g). Age in lay and egg size had no significant ( $P>0.05$ ) effects on fertility with mean per cent fertilities of 81.22, 81.56 and 85.07 for small, large and medium sizes respectively. Mean per cent hatch of fertile eggs were similar for medium (88.24) and large (84.79) eggs but both were significantly ( $P<0.01$ ) better than for small eggs (72.12). A stronger relationship between fertility and hatchability was noted in medium ( $r = 0.92$ ) and large ( $r = 0.95$ ) eggs than with small ( $r = 0.84$ ) eggs. There was no significant ( $P>0.05$ ) effect of age in lay on hatchability. Data suggest that eggs within the intermediate and large size ranges would hatch better than those within the small size range.

Several workers have elaborated on factors affecting fertility and hatchability of chicken eggs. Such factors include plane of nutrition, conditions and length of storage of eggs, strain, egg quality and mating ratio (Stromberg, 1975; Landauer, 1967; North, 1981; Pascal, 1981; Stahl *et al.*, 1986; Peebles and Brakes, 1987). However, the relationship between age of birds in lay and egg size on fertility and hatchability still remains controversial among Scientists. While Oluyemi and Roberts (1979) found no significant effect of egg size on hatchability, Williamson and Payne (1978) obtained

significantly higher percentage hatch with medium than with small and large eggs. Egg size differential within intermediate range were found not to affect hatchability (Landauer, 1967). There are limited information in the Sub-humid environment concerning the effects of age in lay and egg size on the reproductive performance of chicken. This study was therefore carried out to investigate the effects of age of birds in lay and egg size on fertility and hatchability of the eggs of Hyperco White broiler breeders.

A total of 168 hens and 24 cocks of Hyperco White broiler breeders raised on deep litter in four replicate breeding pens with a mating ratio of 1 cock: 6 hens were used for the study. Average floor space provided per bird was 0.26m<sup>2</sup>. Breeder ration formulated to contain 2.95 Mcal.M.I./kg and 16.25% C.P. was fed with water offered *ad libitum* throughout the study period, 1-6 months in lay. Eggs monitored were those collected within the last two weeks of every month and a total of 2,966 normal eggs of the various sizes; small (37.5-44g), medium (45-50g) and large (51-56g) were studied. Eggs were identified according to size, stored at a temperature of 5°C and fumigated with formalin on potassium permanganate (2:1 ratio) before incubation using a Western-19-type incubator. Fertility of eggs set was determined by candling on the 18th day while hatching was completed on the 21st day of incubation. Two hatches at an interval of 7 days were obtained per month and data on number of eggs set, fertility and hatchability pooled to obtain the monthly mean values.

Data on parameters measured were subjected to one-way analysis of variance with age in lay and egg size as main effects. Fertility and hatchability traits were analysed using the model:

$$Y_{ijk} = U + A_i + S_j + e_{ijk}$$

where

$Y_{ijk}$  is the observation; fertility and hatchability

$U$  is the overall mean

$A_i$  is the  $i^{\text{th}}$  age in lay

$S_j$  is the  $j^{\text{th}}$  size of egg

$e_{ijk}$  is the error term

Treatment means were separated using Duncan Multiple Range Test method (Steel and Torrie, 1960).

Data (Table 1) reveal a significant ( $P < 0.05$ )

age in lay effect on egg production and size with both parameters increasing with age similar to reports by Daspurakayastha (1980), Shrivasta (1980), Pascal (1981) and Kekeocha (1984). As birds got older in lay, production of small size eggs significantly ( $P < 0.05$ ) declined at an average percentage rate of 17.40 while medium and large egg production increased at 12.98 and 16.85% respectively. This observation in pattern of egg production could be a reflection of the type of birds (Asuquo *et al.*, 1991-in press).

No significant ( $P > 0.05$ ) difference in per cent fertility due to egg size or age in lay was observed though, differences in mean values occurred in agreement with the findings of Pascal (1981). The apparently low fertility noted across sizes (Table 1) during the first two months followed by accelerated increases

TABLE 1 MONTHLY NUMBER OF EGGS SET, PER CENT FERTILITY AND HATCHABILITY OF FERTILE EGGS

Age in Lay (wks)	Number of eggs set			Percent Fertility			Percent Hatchability		
	S	M	L	S	M	L	S	M	L
4	164	123	102	78.75	83.03	80.09	75.35	86.55	85.71
8	149	168	121	79.25	83.75	80.45	69.03	87.56	85.18
12	126	187	152	80.43	84.84	81.79	74.30	87.94	85.10
16	105	226	196	81.25	85.38	81.63	72.41	88.73	85.15
20	67	238	245	83.32	85.71	82.31	70.35	89.16	84.28
24	44	265	288	84.34	87.69	82.89	71.27	89.47	83.33
Mean				81.22 <sup>a</sup>	85.07 <sup>a</sup>	81.53 <sup>a</sup>	72.12 <sup>ab</sup>	88.24 <sup>ac</sup>	84.79 <sup>ac</sup>
S. E.				±0.91	±0.40	±0.47	±0.98	±0.44	±0.35

a, b, c, Mean values comparing fertility and hatchability are significantly different ( $P < 0.05$ ) if followed by different superscripts.

in fertility up to the 6th month, could be explainable on the level of sexual maturity and increased activity of the cocks. McCartney (1976), found enhanced fertility in broilers which resulted from increased sperm accumulation in the hen. Flock mean per cent fertility within the study period was 82.62.

Hatch of fertile eggs was significantly ( $P < 0.01$ ) affected by egg size contrary to the observations by Pascal, 1981 and Oluyemi and Roberts (1979). Mean per cent hatch were not significantly ( $P > 0.05$ ) different between medium and large eggs (Table 1) but both were better than for small eggs similar to earlier reports (Landauer, 1967, Nesheim and Card, 1972; Williamson and Payne, 1978) that egg size affects hatchability. Mandlekar (1981) reported highest per cent hatch with eggs that weighed between 51-59g. A stronger relationship between fertility and hatchability was noted in medium ( $r = 0.92$ ) and large ( $r = 0.95$ ) eggs than with small ( $r = 0.84$ ) eggs. There was no significant ( $P > 0.05$ ) effect of age in lay on hatchability of fertile eggs. The breed attained an average per cent hatch of 81.72 of fertile eggs similar to the value of 81.64 recorded by Mandlekar (1981).

Results from the study indicate that egg size within the intermediate range; 45-56g would hatch better than small.

## REFERENCES

- DASPURAKAYASTHA, P. C. (1980). Principles of Incubation. S. Bose: ed. Ind. Poult. Review; Vol.xi, 16:22.
- KEKEOCHA, C. C. (1984). Management of layers. Poultry Production Handbook Pfizer Corporation. Nairobi: 21-23.
- LANDAUER, W. (1967). The hatchability of chicken eggs as influenced by environment and heredity. Monogr. I. (Rev). Storrs. Agric. Exp. Sta. Storrs C.T.
- MANDLEKAR, D. H. (1981). A note on Fertility and Hatchability and Egg Weight in Broiler Chicken. Ind. Poult. review. Vol.xiii: 8: 33-34.
- MCCARTNEY, M. G. (1976). The effect of semen dosage and insemination freq. on fertility of broiler breeder hens. Poult. Sci: 55: 669-671.
- NESHNEIM, M. C. and CARD, L. E. (1972). Tropical Agriculture. (4th ed.). MacMillan Press Ltd.: 52-58.
- NORTH, M. O. (1981). Egg quality as a major hatchability factor. Ind. Poult. Review. Vol.xiii: 1: 32-35.
- OLUYEMI, J. A. and ROBERTS, F. A. (1979). Poultry Production in Warm Wet Climates. MacMillan Publ. Ltd. London: 29-31.
- PASCAL, J. (1981). "Editorial" Poult. Sci.: 2167 - 2171.
- PEEBLES, F. D. and BRAKES, J. (1987). Eggshell quality and hatchability in broiler eggs. Poult. Sci., 66: 596-604.
- SHRIVASTAVA, H. P. (1980). Egg Size Influence Factors. Central Avian Res. Inst., I. V. R. I. Campus Izatnagar. 18-19.
- STAHL, J. L., COOK, M. E. and SUNDE, M. L. (1986). Zinc supplementation: Its effect on egg production, feed conversion, fertility and hatchability. Poult. Sci., 65: 11; 2104-2109.
- STEEL, R. G. D. and TORRIE, J. H. (1960). Principles and Procedures of Statistics. McGraw-Hill Book Co., Inc., New York. N.Y.
- STROMBERG, J. (1975). A Guide to better Hatching. Stromberg Publ. Co. Iowa, U.S.A. : 8-25.
- WILLIAMSON, G. and PAYNE, W. J. A. (1978). An Introduction to Animal Husbandry in the Tropics. 3rd ed. Longman Inc. New York: 1266-1274.