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National Animal Production Research Institute
Ahmadu Bello University
P.M.B 1096, Shika-Zaria,
Kaduna State, Nigeria.
Email:japr@napri.gov.ng
Website: http://journals.napri.gov.ng

COMPARATIVE EVALUATION OF SELECTED AND CONTROL LINES OF NAPRI-X BROILER FOR REPRODUCTIVE PERFORMANCE UNDER SHORT TERM SELECTION

***[1]Adejoh-Ubani, E. O., [1]Nwagu, B. I., [1]Adeyinka, I. A., [2]Orunmuyi, M., [1]Abeke, F. O., [1]Sekoni, A. A., [1]Otu, M. O. and [3]Akinsola, O. M.**

[1]National Animal Production Research Institute (NAPRI), Shika, Zaria, Kaduna State, Nigeria.
[2]Department of Animal Science, Federal University Oye-Ekiti, Ekiti State, Nigeria
[3]Department of Animal Science, Ahmadu Bello University, Zaria, Kaduna State, Nigeria

ABSTRACT

A study was carried out to evaluate reproductive performance under a short term selection programme in two lines of Napri-X broilers under selection for three generations. Traits considered were {egg set, number fertile (NFERT), number hatch (NHAT), number dead in shell (NDD), percent fertility (PFERT), percent hatch (PHAT) and percent hatchability (PHATY)}. The lines (Sire line and Dam line) were developed respectively through selective breeding for body weight at eight weeks (BWT_8) in a pedigreed foundation stock of broilers. Mating ratio was 1 cock: 6 hens within families and across lines. Selection was carried out from base to the third generation. Eggs for the study were appropriately marked and hatched in individual hatching compartments to prevent crossing of the chicks at break-out. Data on reproductive traits were recorded for seven hatches for each of the lines. Percent fertility, percent hatch and percent hatchability were calculated. Fertility and hatchability percentages were transformed to arcsin ! % and analyzed according to Student's t-test and the trend of the results represented in charts. All measured variables (egg set, number fertile, number hatched and number dead in shell) and reproductive indices (percent fertility, percent hatchability and percent fertile) were significantly ($P<0.01$) different between the two lines. Sire line recorded a decreasing trend with an estimate of 15.57(egg set), 14.46 (number fertile), 11.46 (number hatch) and 2.86 (number dead in shell). Egg set (10.45, 11.85, 11.69 and 7.14), number fertile (9.47, 10.46, 9.65 and 5.25), number hatch (7.34, 5.66, 6.81 and 3.25) and number dead in shell (4.86, 5.23, 7.14 and 7.38) were the averages for sire and dam selected and control lines. Sire and dam lines selected and control recorded values of 89.16, 89.46, 83.06 and 76.58% (percent fertility), percent hatch (70.88, 53.52, 59.24 and 50.39%) and percent hatchability (80.27, 59.08, 71.32 and 64.12%), respectively. This implies that traits under selection were highly variable Due to the significant effect of lines and generation on reproductive traits, these factors should be taken into consideration for selection purposes.

INTRODUCTION

The genetic make-up of an individual is fixed at fertilization and hence, fertility and hatchability in poultry production are generally considered as traits derived from the two parents. It is perhaps best defined as the interaction between male and female gametes in the production of a viable zygote i.e. the proportion of eggs that are capable of developing into chicks out of number laid or incubated (Brillard, 2004). It determines the number of offspring that can be obtained from a given number of eggs. Fertility is expressed as the percentage of eggs fertilized and it is judged by candling on the 18th day of incubation. It is difficult to differentiate between low

fertilization and high degree of early embryonic death. Thus, errors are made at times in determining fertility in most hatcheries because fertility and hatchability of fertile eggs are frequently considered together as hatchability of all eggs set. Alsobayel and Albadry (2012) separated fertility and hatchability by examining unhatched eggs for evidence of embryonic death. They pointed out that if apparently infertile eggs were not broken out to determine fertility; early embryonic death could be wrongly classified as infertile. A major problem encountered with commercial broiler breeder flocks has been the often dramatic decrease in fertility during the latter part of the laying period, particularly after 50 weeks of age (Romero – Sanchez *et al.,* 2007).

A commonly occurring problem in all avian species studied is the relatively poor reproductive performance of birds selected for increased growth rate. This poor performance is usually reflected as decrease in total egg production and increase in production of unsuitable eggs for setting such as, soft-shelled membrane and double-yolked eggs (Reddish and Lilburn, 2004). Therefore, the merits of selection methods to increase genetic gain depends not only upon direct response alone but also upon associated changes in other economically or biologically important traits due to correlated response (Aboul-Seoud, 2008). Therefore, this study was designed on elucidating the reproductive potential of two broiler lines, which could be used as foundation stock for commercial broiler production.

MATERIALS AND METHODS

Location of the Study

The research was conducted at the Poultry Breeding Unit of Poultry Research Programme of the National Animal Production Research Institute (NAPRI) Shika, Zaria. Shika is located in the semi-arid, Northern Guinea savanna zone of Nigeria within latitude $11^{o}8'$N and $07^{o}4'$E with an elevation of 2178 feet (663.77 metres) above sea level. The average annual precipitation is 1,100mm, which spreads from late April or early May to mid- October, with a peak between June and September (wet season). The wet season is usually followed by "Harmattan", a period of cool, dry weather which lasts from mid-October to February (post rains). The mean maximum temperature varies from 27^{o}C to 35^{o}C depending on the season; and the mean relative humidity during Harmattan and wet season are 21 and 72 %, respectively (Ovimaps, 2014).

Experimental Animals

A total of 1200 hens and 1000 cockerels were pedigree hatched for each line (sire line and dam line). Chicks were wing-banded at day old, brooded and reared to point of lay. A total of 1060 (sire line) and 341 birds (dam line) had complete records at the end of 8 weeks. At the end of rearing, a total of 10 cockerels and 60 hens were picked at random to constitute the control population, while 20 cockerels and 120 hens with the highest body weights were selected based on their corrected eight week body weights for each line. The birds were mated in the ratio of 1 cockerel to 6 hens to produce eggs which were hatched for generation 1. The deep litter system of management was used to rear the birds from day old to 8 weeks of age. A total of 265 (sire line selection), 859 (dam line selection), 333 (sire line control) and 492 (dam line control) in generation 1, 595 (sire line selection), 764 (dam line selection), 257 (sire line control) and 454 (dam line control) generation 2 and 385 (sire line selection), 351 (dam line selection), 261 (sire line control) and 329 (dam line control) generation 3 had complete records at the end of 8 weeks).

Reproductive Traits.

Data on fertility and hatchability were recorded for seven hatches for each line. Percent fertility, percent hatch and percent hatchability were calculated as follows.

$$\text{Percent Fertile (PFERT)} = \frac{\text{Total number of fertile eggs}}{\text{Total number of eggs set}} \text{x} 100$$

$$\text{Percent Hatch (PHAT)} = \frac{\text{Total number of chicks hatched}}{\text{Total number of eggs set}} \text{x } 100$$

$$\text{Percent Hatchability (PHATY)} = \frac{\text{Total number of chicks hatched}}{\text{Total number of fertile eggs}} \text{ x } 100$$

Fertility and hatchability percentages were transformed to arcsin ! % and analysed according to Student's t-test (Snedecor and Cochran, 1967).

RESULTS AND DISCUSSION

Figures 1 and 2 show the reproductive measured traits and computed indices of the sire and dam line broilers in the base generation. Broiler line affected ($P<0.01$) all the measured variables and reproductive indices. Dam line had higher values for egg set (18.85), number fertile (12.15), number hatched (4.61) and number dead in shell (5.16). The corresponding lower values recorded for sire line were 15.57, 14.46, 11.46 and 2,86, respectively for egg set, number fertile, number hatched and number dead in shell.'

Sire line had average values of 92.49 (percent fertility), 72.38 (percent hatchability) and 77.71 (percent fertile), while the dam line recorded values of 63.01, 23.30 and 32.26 for percent fertility, percent hatchability and percent fertile respectively. However, sire line had higher values compared to the dam line for all the reproductive parameters (Figure 2).

The pooled measured reproductive variables and computed indices in the sire and dam selected and control broiler lines for all generations are shown in Figures 3 and 4, respectively. The measured variables {egg set, number fertile (NFERT), number hatch(NHAT) and number dead in shell (NDD)} and reproductive indices {percent fertility (PFERT), percent hatch (PHAT) and percent hatchability (PHATY)} were statistically significant ($P<0.01$) between the sire and dam lines selected and control. Egg set (10.45, 11.85, 11.69 and 7.14), number fertile (9.47, 10.46, 9.65 and 5.25), number hatch (7.34, 5.66, 6.81 and 3.25) and number dead in shell (4.86, 5.23, 7.14 and 7.38) presented the above averages for sire and dam selected and control lines. Sire and dam lines selected and control recorded values of 89.16, 89.46, 83.06 and 76.58% (percent fertility), percent hatch (70.88, 53.52, 59.24 and 50.39%) and percent hatchability (80.27, 59.08, 71.32 and 64.12%), respectively. The significant difference observed between the lines across different generations in egg set, number fertile, number hatch and number dead in shell) agrees with the report of Chao and Lee (2001) in Taiwan County chickens. Estimated values for all the measurable traits were within the range reported by Szwaczkowski *et al*. (2003) and could be

attributed to sex-linked effects, but not consistent with estimates of some authors (Baffour-Awuah *et al*., 2000; Saatci *et al*., 2006).

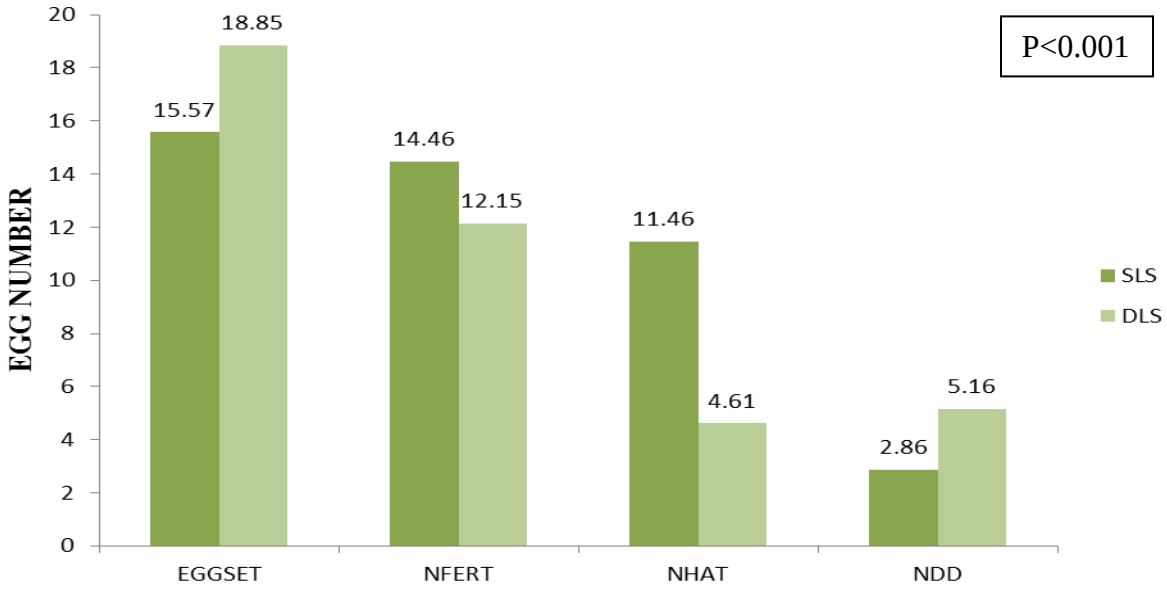


Figure 1: Reproductive measured variables in sire and dam lines of broilers at base generation

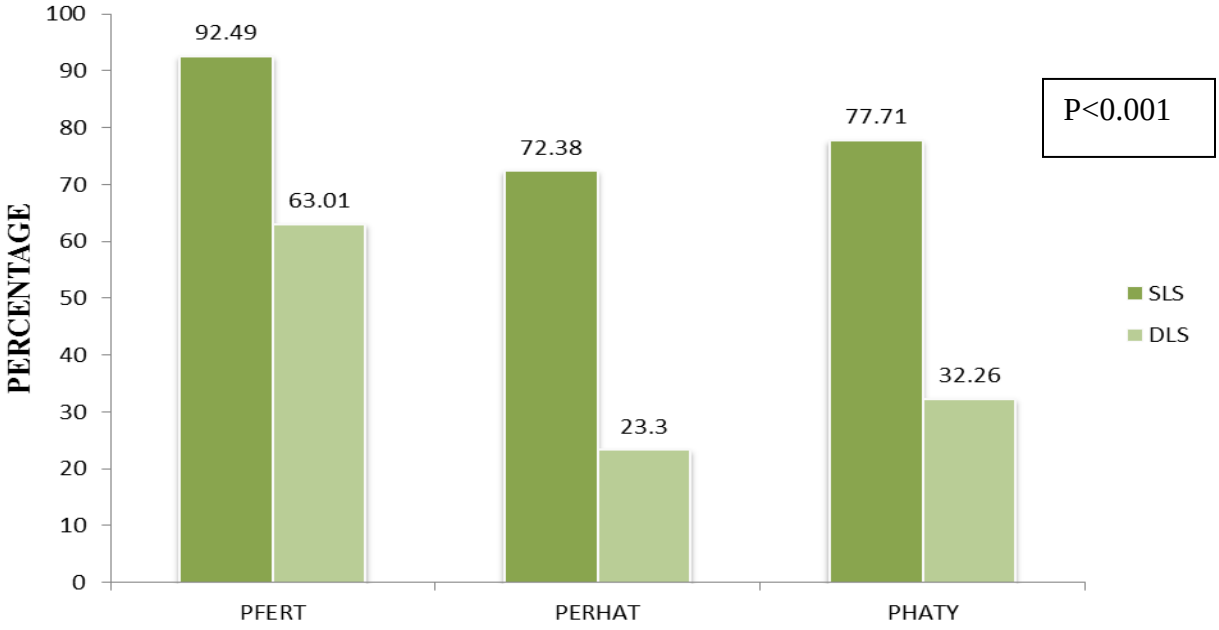


Figure 2 Reproductive indices in sire and dam lines of broilers at base generation

The high upper limit values of percentage fertile, percentage hatch and percentage hatchability are within the range reported in literature. Bilcik and Estevez (2005) reported 83.80% for fertility

and 43.32% for hatchability in a White Leghorn population. Chao and Lee (2001) reported 85% and 87% fertility in two experiments in Taiwan County chickens. Szwaczkowski *et al*. (2003) also reported 87.1% fertility and 75.5% of eggs hatched. The percentage of eggs hatched reported by these authors are however higher than the values obtained in this study. Peters *et al.* (2008) found significant differences between the means for fertility and hatchability of fertile eggs, in their work on different crosses between seven male and six female broiler lines.

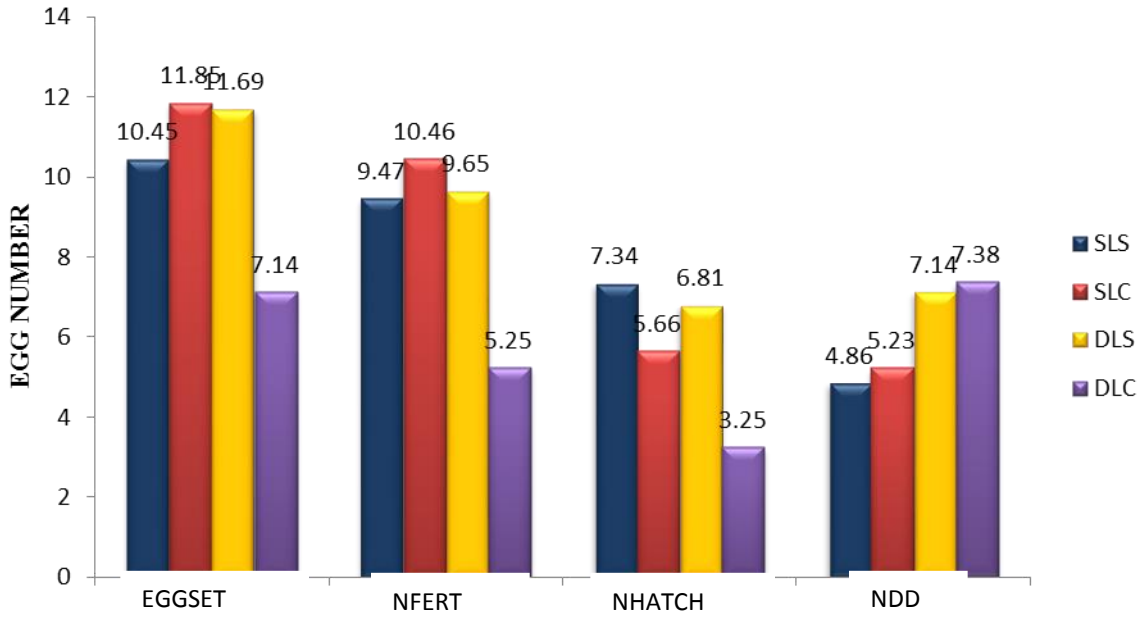


Figure 3: Pooled analysis of reproductive measured variables of sire and dam lines selected and control lines

They observed that the means for fertility and hatchability of total eggs were significantly different, depending on the broiler cross evaluated. This result is inconsistent with the findings of Orunmuyi *et al.* (2011) for two strains of Rhode Island chickens but in line with percent estimate of 83.7 and 73.3 % reported by Ajayi *et al. (*2008) for different genotypes of indigenous chicken. Estimate obtained in this study was inconsistent with the findings of Akanni *et al.* (2008) who recorded 23.02% for the B-alpha chicken. The result is also in consonance with the report of Islam *et al*. (2002) in their work on comparative assessment of fertility and Hatchability of Barred Plymouth Rock (BPR), White leghorn(WLH), Rhode Island Red(RIR) and White Rock Hen(WR) , where they reported significant positive correlation found between fertility and hatchability on fertile eggs. They obtained fertility of 88.81, 94.75%, 88.29% and 92.16% in BPR. WLH, RIR and WR, with hatchability of fertile eggs of 88.59, 90.15, 88.37 and 91.93, respectively, and concluded that breed had little or no effect on hatchability on fertile eggs.

In conclusion, Hatchability and Fertility were highly variable in sire and dam lines. Considering the overall reproductive traits, it can be concluded that line has little effect on reproductive traits of fertile eggs in chickens.

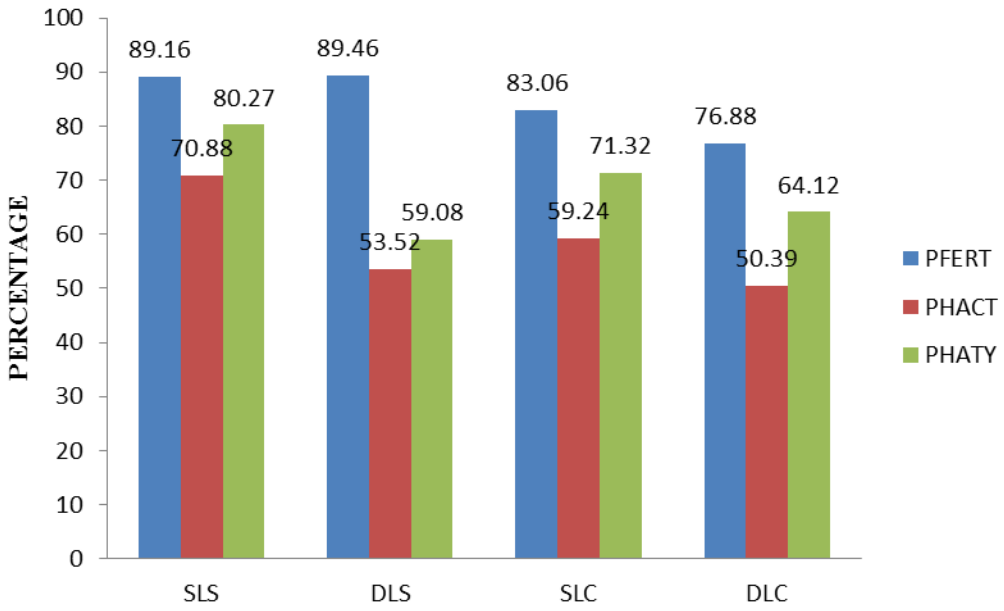


Figure 4: Pooled effects of reproductive indices of sire and Dam selected and control lines

REFERENCES

Aboul-Seoud, D.I.M. (2008). Divergent selection for growth and egg production traits in Japanese quail. A Ph.D Thesis, Department of Animal Production, Faculty of Agriculture Al-Azhar University, Egypt.Pp 145.

Alsobayel, A.A and Albadry, M.A (2012). Effect of age and sex ratio on fertility and hatchability of Baladi and Leghorn laying hens. *Journal of Animal and Plant Sciences*, 22(1): 15-19.

Ajayi, F. O. and Ejiofor, O. (2009). Effects of genotype x sex interaction on growth and some development characteristics of Ross and Anak broiler strains in the high rainforest zone of Nigeria. *Asian Journal of Poultry Science*, 5 (2) 1 – 6.

Ajayi, F.O., Ejiofor, O., Ironke, M.O. (2008). Estimation of body weight from linear body measurements in two commercial meat-type chickens. *Global Journal of Agricultural Sciences*, 7(1): 57-59.

Baffour-Awuah, O., Ampofo E. and Dodoo, R. (2000). Predicting the live weight of sheep by using linear body measurement. *Ghana Journal of Agricultural Science*, 33: 207-212.

Bilcik, B. and Estevez, I. (2005). Impact of male-male competition and morphological traits on mating strategies and reproductive success in broiler breeders. *Journal of Applied Animal Behavioural Science*, 92: 307-323.

Brillard, J.P. (2004). Natural mating in broiler breeders: Present and future concerns**.** *World Poultry Science Journal*, 60**:**439-445.

Orunmuyi, M., Adeyinka, I.A. and Oni, O.O. (2011*)*.Genetic parameter estimates (full sib and half sib analysis) of fertility and hatchability in two strains of Rhode Island chickens *Nigerian Journal of Animal Production*, 38(1): 14-22.

Ovimaps, (2014). Ovi location map; Ovi earth imagery date; July 3rd, 2014.

Reddish, J.M. and Lilburn, M.S. (2004). A comparison of growth and development patterns in diverse genotypes of broilers. 2. Pullet growth. *Poultry Science*, 83: 1072-1076.

Romero-Sanchez, H., Plumstead, P.W. and Brake, J. (*2007).* Feeding broiler breeder males. 1. Effect of feeding program and dietary crude protein during rearing on body weight and fertility. *Poultry Science,* 86*:* 168–174*.*

SAS. (2008)**.** Statistical Analysis Systems, Computer Software, Version 9.2. SAS Institute Inc., Cary, Northern California, USA. Page 170.

Saatci, M., Omed, H. and Dewi, I.A. (2006). Genetic parameters from univariate and bivariate analysis of egg and weight traits in Japanese quail. *Poultry Science,* 85: 185-190.

Snedecor G. W., Cochran W. G., 1967. Statistical methods. Iowa, Iowa State Univ. Press.

Szwaczkowski, T., Cywa-Benko, K. and Wezyk, S. (2003). A note on inbreeding effect on productive and reproductive traits in laying hens. *Animal Science Papers and Reports*, Page 21.