

EFFECT OF GENERATIONS OF SELECTION ON REPRODUCTIVE PERFORMANCE OF TWO STRAINS OF TURKEY (*MELEAGRIS GALLOPAVO*) AND THEIR RECIPROCAL CROSSES

¹Shettima, M. M., ²Kabir, M., ²Yahaya, H. K. and ³Iyiola-Tunji, A.O.

¹Department of Animal Science, Borno State University, Maiduguri, Borno State

²Departments of Animal Science, Ahmadu Bello University, Zaria

³National Agricultural Extension and Research Liaison Services, Ahmadu Bello University.

¹*Corresponding author: 08066355565 Email: shettimamaryam500@gmail.com

ABSTRACT

A two generational study was conducted to determine the reproductive performance of two strains of native turkeys. For the generation 1 G_1 total of 180 poult were produced from a foundation stock of white, black, main (white male X black female) and reciprocal cross (black male X white female). A four breeding group was formed according to the foundation stock. (45 poult per breeding group) which were replicated thrice (15 poult per replicates). At 8 weeks, 1 tom and two hens with higher body weight were selected per replicates and are used to collect reproductive data. Same procedure was applied to generation 2 G_2 to collect data. Data generated were subjected to the General Linear Model (GML) procedure of SAS, differences among the strains and their crosses in terms of reproductive traits were compared using Duncan Multiple Range Test (DMRT). Results revealed significantly ($p < 0.05$) higher egg number (5.15 ± 0.16), (4.66 ± 0.16) (per week) and body weight at first egg laid (3632.88 ± 48.98) (3532.53 ± 48.98) (kg) in generation two over generation one. So turkeys can be selected for improved 8-weeks body weight to improved reproductive traits. Whereas fertility (72.70 and 63.49) and hatchability (56.76 and 41.09) were higher in generation one over generation two. No significant difference ($p > 0.05$) was observed among strain in all the reproductive traits measured in generation one except in hatchability but in generation two, white strain and main cross had significantly ($p < 0.05$) higher (5.4 and 5.0) egg number (per week) and early age at first egg lay (26 and 27 weeks), so they are recommended for reproduction.

Key words: Generation of Selection, Reproductive Traits, Two Strains, Crosses, Turkey

Introduction

Turkey production is an important and profitable agricultural industry, with rising global demand for its products (1). Despite its important, in Nigeria, its production remained at small holder level and not popular due to various reasons such as scanty of information on turkey in terms of species/breed type, adaptability, diseases and parasite to issues of feed and feed resources (2).

The main aim of turkey breeder production is to increase the number of poult produced. Egg number, fertility and hatchability are the major determination of profitability in turkey breeding farm (3). Egg yields in turkey are very low, in addition they also have unsatisfactory egg fertility and hatchability (4). Fertility and hatchability are interrelated heritable characters that vary among breeds, variety and also individual in a variety (5). This paper therefore tends to investigate the reproductive potentials of two strains of local turkey and their crosses over two generations of selection.

Materials and Methods

Experimental site

The research was conducted at the Teaching and Research Farm of Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University Zaria, Nigeria. Detailed description of the site was as given by (6).

Mating design and management of experimental birds:

The foundation stock consists of 36 adult turkeys of two different strains that comprised of 12 males and 24 females, grouped into four breeding groups of white strain, black strain, main cross and reciprocal cross which were replicated thrice. Eggs were collected and hatched a total of 180 (G_1) poult were produced. At 8 weeks, 12 toms and 24 hens with high body weight were selected while others were maintained as control group. The selected toms and hens were used as the parents of the second generation. The same procedure was followed to produce the (G_2) and data was collected from the

selected. Traits such as egg number, age at first lay, body weight at first lay fertility and hatchability were collected from both the G₁ and G₂.

The birds were fed starter diet that contains 2800 kcal ME/kg with 28% CP, grower diet of 2900 kcal ME/kg with 18% CP and breeder diet of 2900 kcal ME/kg with 15% CP (7). They were fed *ad libitum*, clean drinking water provided. Necessary medications and vaccinations were administered as when due to ensure good health and improved egg production.

Data collection

Egg number: Is the number of egg laid per week by each genotype.

Age at first lay: Age of hens at first egg laid.

Body weight at first lay: weight of dam at first egg laid by each genotype

$$\text{Fertility (\%)} = \frac{\text{Number of fertile eggs}}{\text{Total number of eggs incubated}} \times 100$$

$$\text{Hatchability (\%)} = \frac{\text{Number of chicks hatched}}{\text{Number of fertile eggs}} \times 100$$

Experimental design:

Data generated were subjected to the General Linear Model (GML) procedure of SAS (8). The difference between generation and among the strains were compared using Duncan Multiple Range Test (DMRT) (9).

Results and Discussion

Table 1 shows the effect of generation on reproductive traits of turkey. Significant differences ($p < 0.05$) were observed in all the reproductive parameters measured except age at first lay where no significant differences ($p > 0.05$) were noticed between generation one and two. Egg number per week (5.15 ± 0.16), (4.66 ± 0.16) and body weight at first egg lay (3632.88 ± 48.98) (3532.53 ± 48.98) were significantly ($p < 0.05$) higher in generation two over generation one. This shows that egg production increases as we select for increased 8 weeks body weight. Similarly, **(10) as updated by (11) observed a significant increase in egg number in line selected short-term for increased Body Weight.** This is contrary to the report of (11) who **noticed** loss of three eggs per hen per generation as he **selected for 16-weeks increased body weight.** On the other hand, generation one had significantly higher fertility (72.70 ± 1.33) and hatchability (56.76 ± 1.61) than generation two (63.49 ± 1.33) (41.09 ± 1.61). This shows that fertility and hatchability decreases due to selection for increased 8-weeks body weight. This is similar to the study of (11) who observed decrease in **fertility and hatchability in selected line compared to the control line even though selected line hens were artificially inseminated more frequently than Random Bred Control hens. Similarly, (10) as updated by (11) reported that duration of fertility was reduced by selecting for increased growth rate. Contrarily, (12) did not observe any differences in fertility, or hatch of fertile eggs during the first five generations of selection in line selected for increased body weight and shank width for 14 generations.**

Table 1: Effect of generation on reproductive traits of turkey

	Grand mean	Generation 1	Generation 2	LOS
Egg number (per week)	4.90 ± 0.11	4.66 ± 0.16^b	5.15 ± 0.16^a	*
Fertility (%)	68.09 ± 0.94	72.70 ± 1.33^a	63.49 ± 1.33^b	*
Hatchability (%)	48.92 ± 1.14	56.76 ± 1.61^a	41.09 ± 1.61^b	*
BW at maturity (g)	3582.70 ± 34.64	3532.53 ± 48.98^b	3632.88 ± 48.98^a	*

Age at maturity (weeks)	27.44±0.16	27.22±0.23	27.66±0.23	NS
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^{ab} means with different superscript on the same row are significantly different at $p<0.05$; NS= Not significant; LOS= level of significant; Age= in week; BW= body weight.

Table 2 shows the effect of genotype on reproductive traits of turkey in generation 1 and 2. There were no significant difference ($p>0.05$) observed in most of the parameters recorded in generation one excepts in hatchability where significantly higher value ($p<0.05$) was observed in black strain (62.531 ± 4.13), which is similar to main cross (58.929 ± 4.18) and reciprocal cross (58.462 ± 4.06) with white (46.770 ± 2.16) having the least value. This is in accordance with the study of (5) who said hatchability is heritable character that vary among strains. But the eggs were artificially incubated therefore the difference observed here might not be a character of the strain. In generation two, white strain is significantly $p<0.05$ superior in egg number (per week) (5.38 ± 0.22) and age at first egg lay (25.6250 ± 0.65) which is similar to main cross (5.01 ± 0.22) (27.0000 ± 0.59) compared to reciprocal cross (4.63 ± 0.22) (27.5000 ± 0.63) and black strain (4.60 ± 0.22) (28.7500 ± 0.37). These shows that white and main cross are the best strains for reproduction. Reciprocal cross (3754.31 ± 69.27) had higher body weight at first egg lay and is similar to black (3630.25 ± 69.27), with main cross and white having similar and lower weights. The pattern of egg lay and the age at maturity observed in this study is in accordance with the study of (13) who reported that he collects one egg every alternate day from six month of age, in the same vein, (14) observed age at sexual maturity to be 23-26 weeks. No difference was observed in fertility and hatchability.

Table 2: Effect of genotype on reproductive traits of turkey in generation 1 and 2

Gen	Parameters	Main cross	White	Black	Reciprocal cross	LOS
1	Egg number (per week)	4.8333±0.47	5.3056±0.29	4.3056±0.40	4.1944±0.29	NS
	Fertility (%)	77.540±2.88	64.359±2.02	77.652±2.94	70.466±3.70	NS
	Hatchability(%)	58.929±4.18 ^{ab}	46.770±2.16 ^b	62.531±4.13 ^a	58.462±4.06 ^{ab}	*
	BW at maturity (g)	3583.8±67.33	3552.6±121.87	3554.0±91.90	3841.1±108.67	NS
	Age at maturity (weeks)	27.500±0.33	27.7500±0.36	27.6250±0.26	27.7500±0.25	NS
2	Egg number	5.01±0.22 ^{ab}	5.38±0.22 ^a	4.60±0.22 ^b	4.63±0.22 ^b	*
	Fertility (%)	69.17±1.88	65.51±1.88	69.88±1.88	67.83±1.88	NS
	Hatchability (%)	49.77±2.27	47.75±2.27	48.58±02.28	49.59±2.28	NS
	BW at maturity (g)	3527.31±69.27 ^{bc}	3418.94±69.27 ^c	3630.25±69.27 ^{ab}	3754.31±69.27 ^a	*
	Age at maturity(weeks)	27.0000±0.59 ^{ab}	25.6250±0.65 ^a	28.7500±0.37 ^c	27.5000±0.63 ^b	*

^{abcd} means with different superscript on the same row are significantly different at $p<0.05$; NS= Not significant; LOS= level of significant; BW= body weight.

Conclusion

Egg number per week and body weight at first egg lay increases due to selection for increased 8-weeks body weight though this resulted in lower fertility and hatchability. Native turkeys can be selected for increased 8-weeks body weight to improved egg number and body weight at first egg lay but care should be taken on fertility and hatchability.

Though no difference was observed among strain and their crosses in all the reproductive traits measured in generation one except in hatchability but the eggs are artificially incubated therefore is not a strain

effect. While in generation two, white strain and main cross had higher egg number and early age in maturity therefore they are recommended for reproduction.

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