Faculty of Agriculture

SELECTION FOR AUGMENTING EARLY GROW TH RATE IN JAPANESE QUAIL

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B.Sc. in Agriculture Sciences (Poultry Production)
Fac., Agric., Fayoum, Univ., 2016.

THESIS

Submitted in Partial Fulfillment of the Requirements for the Degree of M.Sc. in Agriculture Sciences (Poultry Breeding)

Department of Poultry Production

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FAYOUM UNIVERSITY

2020

SUMMARY AND CONCLUSION

A total number of 10,024 birds (1300 in the pre-base population, 1726 in the base population, 5176 for the selected line and 1822 for the control line) were used during a selection experiment that continued for six generations (four selection generations) at the Poultry Research Center, Faculty of Agriculture, Fayoum University. This study aimed to augment early growth rate in Japanese quail. The line selected for high growth rate during the period from one to 21 days of age (HGR_{1-21}) was selected according to the estimated aggregated breeding values for four successive generations, while a random bred control line (CL) was kept under random mating.

Traits that studied throughout the course of the selection study were:

Body weight at different ages **(**BW at hatch, seven, 14, 21, 28 and 35 days of age), growth rates per chick during different periods ($GR_{1-7,}$ $GR_{1-14,}$ $GR_{1-21,}$ GR_{1-28} and GR_{1-35}) of growth and body weight gain during the period from hatch up to 35 days of age (BWG_{1-35}), egg production-related traits for each female during the first month of production (Age at first egg : AFE, day), body weight at first egg (BW_{AFE}, g), days needed to produce the first ten eggs ($DN_{10,}$ day), age at the first ten eggs (AGE_{10}, day), number of eggs produced (EN_{FM}, egg), egg mass (EM_{FM}, g), average egg weight (AEW_{FM}, g) , clutch number (CN_{FM}, as a number of clutches /hen), clutch size (CS_{FM}, as an average of clutch eggs /hen), pause duration length (PDL_{FM}, days) for the first month of production and age after first month of production (AGE_{FM}, day). Fitness traits **(**Fertility% and hatchability %) and embryonic mortality (measured as early and late embryonic mortality**)** for studied lines in different generations were estimated.

A slaughter test was performed at 35 days of age at the fourth generation using 100 quail (25 chicks per sex within each line) for whole body carcass analysis and carcass composition analysis ether extract and protein content were determined. Plasma of tested blood samples were assayed for total cholesterol (mg/dl), high density lipoprotein (HDL, mg/dl), low density lipoprotein (LDL, mg/dl) and triglycerides (TG, mg/dl) by enzymatic

colorimetric tests using commercial kits (STANBIO) according to the manufacturer's recommendations.

Results summarized as follows:

1- GR_{1-21} significantly increased as generation number increased, the G_4 surpassed the G_1 by +4.118% . The HGR_{1-21} significantly exceeded the CL by +0.05 (+2.941%). Males significantly surpassed females by +0.02 (+1.156%) .

2- The effect of short-term selection (four generations) for early growth rate (GR_{1-21}) on all BW traits was found significant. Line significantly influenced body weights from one up to 35 days of age, the selected line showed heavier BW at all ages studied than the control from seven up to 35 days of age except for BW_1. Females had significantly heavier BW than males at all ages studied, except at hatch.

3- The 4^{th} generation obtained faster GR during different periods of growth and had the highest BWG_{1-35}. The HGR_{1-21} had faster GR during all periods of growth studied and higher BWG_{1-35} than the control line. Females showed either faster GR during the periods from 1-14, 1-28 and 1-35 days of age or higher BWG_{1-35} than males.

4- Selection generation significantly affected all egg production- related traits studied indicating that the 4^{th} generation of selection had the earliest AFE and AGE_{10} (47.98 and 60.87 days) . Quail in the 4^{th} generation of selection showed the heaviest BW_{AFE} **(**260.77g) and desirably had lower DN_{10} (13.12 days) and laid heavier AEW (11.88g) whereas the 2^{nd} generation had lighter AWE of 11.34g than other generations. The selected line attained AFE at earlier age with heavier BW_{AFE} and lower DN_{10} and AGE_{10} than the control line . The 4^{th} generation had higher EN_{FM}, heavier EM_{FM}, earlier AGE_{10} and lower PDL_{FM} (24.53 egg, 291.32g, 77.98 and 1.76 days, respectively) than other generations.

5- Quails of the HGR_{1-21} laid more EN_{FM} eggs, higher EM_{FM}, earlier AGE_{FM} (+9.43%, +8.46%, -5.38days), larger CS_{FM} and shorter PDL_{FM} (+25.60% and -11.68 %) than those of the control line.

6- The 4^{th} generation had higher fertility% and hatchability% associated with preferably lower early and late embryonic mortality% than other generations.

7- Quails of the selected line had preferably higher fertility%, hatchability% (+5.64% and +4.89%) but undesirably higher early embryonic mortality% (+18.06%) than those of the control line.

8- Quails of the HGR_{1-21} had significantly and unpreferably lower HDL (good cholesterol) and higher TG whereas both LDL and total cholesterol were insignificantly differed than the control line.

9- Females had significantly higher TG and lower HDL than males.

10- Quails of the HGR_{1-21} significantly had higher carcass %, dressing %, rear % and weights of giblets, heart, gizzard and liver (+3.65%, +2.59,+5.07 ,23.79, 68.42,13.21 and 23.47% respectively) than the control line. Females had higher weights of giblets, gizzard and liver than their counterparts males by +12.41%, 14.64% and 12.34%.

11- **A selection phase:** Females of the selected line showed higher expected genetic response of the selection criterion expressed as absolute values than both males and the combined sex (0.0117 vs 0.0100 and 0.0105) or as percentages (1.17 vs 1.00 and 1.05%).

12- A symmetrical responses of the selection criterion in phenotypic and genetic responses in positive directions with different magnitude were found. The fourth generation of selection showed the highest direct responses for females, males and the combined sex than other generations.

13- Regardless of sex, the values APDR/G and AGDR/G of the selection criterion indicating a symmetrical trend in both magnitude and direction of the present selection experiment. There was sexual dimorphism for APDR/G of the selected line favoring males which surpassed females by +**0.002 (+10.526%)**.

14- The GR_{1-21} had medium direct h^2 and realized h^2, the realized h^2 was a relatively higher in magnitude than its direct h^2 (0.29 >0.28) of the combined sex however, the realized h^2 was lower than its corresponding direct h^2 for females and males**.**

15- No differences between values of expected and effective selection differential for males and the combined sex were found. The $SD_{Eff..}/ D_{Ex}$ ratios equal unity (=1.0) indicating that natural selection was neutral toward GR_{1-21} in the first, second and fourth generations and didn't affect GR_{1-21} across these generations. However, at the third generation of selection the natural selection inhibited selection for high GR_{1-21} of females (the $SD_{Eff..}/ D_{Ex.}$was less than unity, 0.80) whereas the more than unity $SD_{Eff..}/ D_{Ex.}$ (1.33) indicating that natural selection remarkably encouraged (or did not inhibit) selection for $GR_{1-21.}$

16- The realized correlated responses to selection for high GR_{1-21} were significantly higher than their expected responses for body weight traits, There were significantly positive APCR for BW's from 7 up to 35 days of age of females, males and combined sex, except for BW_1.

17- There were significant differences for all BW at all ages in favor to APCR than AGCR, except for BW_1.

18- Significant differences were found for expected vs. realized direct response for GR_{1-28} and BWG_{1-35}.

19- Comparing between expected vs. realized correlated response for egg production related traits indicated that the realized correlated responses to selection for high GR_{1-21} were higher than their expected responses. There were desirably decrease in each of AFE, DN_{10}, PDL_{FM} and AGE_{10} and increases in each of BW_{AFE}, $EN_{FM,}$ EM_{FM} and CS_{FM} favoring the realized parameters than their expected. Therefore, selection for faster GR_{1-21} improved most of studied and important egg production traits**.**

20-The improvements in APCR may be due to the significant increases in environmental changes in the control lines for BW traits which may encourage the morphological change in these traits. The pattern of changes in means of control over generations fairly matched with those observed for the selected line indicating possibly these to be of the environmental origin.

21- There were significant APCR and AGCR for all fitness traits of females and there were significant environmental changes of fitness traits, except

for hatchability%.

22- The GR_{1-21} found to be positively correlated with all BW's weekly measured from 7 to 35 days of age with rg_S ranged from 0.06 to 0.47, and a wide range of rp ranged from 0.18 to 0.52 was shown**.**

23-The GR's during different periods of growth had medium h^2 ranged from 0.17 to 0.20 and showed a wide range of moderate to high rg (0.15 to 0.70) and had a wider range of rp ranged from 0.03 to 0.67**.**

24- The GR_{1-21} had preferably negative correlations either genetically or phenotypically with each of AFE, DN_{10}, AGE_{10}, PDL_{FM} and AGE_{FM}. On the other hand, GR_{1-21} was genetically and positively correlated in a favorable trend with each of BW_{AFE}, EN_{FM}, EM_{FM} and CS_{FM}. Also, positive rps were found between GR_{1-21} and each of with each of BW_{AFE}, EN_{FM}, EM_{FM}, and CS_{FM}. There was negative rp between GR_{1-21} and CN_{FM}.

In conclusion, selection to enhance GR_{1-21} resulted in positive increases in BW from 7 upto 35 days of age, GR_{1-7}, GR_{1-14}, GR_{1-28}, GR_{1-35} and BWG_{1-35}. Selection for increasing GR_{1-21} resulted in desirable decrease or earliness in each of AFE, DN_{10} in the G_4, PD_{FM} in the G_2, AGE_{10} and AGE_{FM} in the G_4. However, increased each of BW_{AFE}, EN_{FM}, EM_{FM}, CS_{FM} and AEW. Also, selection for fast GR_{1-21} improved both fertility% and hatchability% of 4.4% and 6.81% but undesirably increased both early and late embryonic death%. Correlated traits that had low heritability can be improved indirectly through selection for GR_{1-21}.