



Fayoum University

Faculty of Agriculture

**SELECTION FOR HIGH BODY WEIGHT UNDER  
TWO NUTRITIONAL ENVIRONMENTS IN  
JAPANESE QUAIL**

By

**AHMED MOHAMED EMAM ABDEL-ALEEM**

B.Sc. in Agriculture Sciences (Poultry Production)

Fac., Agric., Fayoum, Cairo Univ., 2004.

M.Sc. (Poultry Nutrition) Fac. Agric., Fayoum Univ., 2010.

**THESIS**

Submitted in Partial Fulfillment of the  
Requirements for the Degree of  
**Ph.D. in Agricultural Sciences**  
**(Poultry Breeding)**

Department of Poultry Production

Faculty of Agriculture

**FAYOUM UNIVERSITY**

## ABSTRACT

The present study executed in two phases: **1. Selection phase:** A selection experiment continued for four generations using a total number of 6924 birds. Four quail lines were established: line SN was established for high body weight at 21 days of age ( $BW_{21}$ ) fed the normal (recommended) protein diet (24% CP and 2900 K Cal/ME), line SL was established for high  $BW_{21}$  fed the low protein diet (20% CP and 2900 K Cal/ME) from 10 to 21 days of age, lines CN and CL established from the base population fed the 24% CP for the former and 20% CP for the later, respectively. **2. Testing phase:** At the 3<sup>rd</sup> generation of selection, both selected and their corresponding controls were maintained for one additional experiment within two nutritional environments (100 birds/ line).

**The following results can be summarized as follows:**

**1. Selection phase:**  $BW_{21}$  of the base population can be used as a selection criterion to improve the target productive performance traits since, the increase in  $BW_{21}$  resulted in heavier  $BW_{35}$  (marketing age) and a desirable decrease in sexual maturity (ASM), days needed (DN) to produce the first 10, 30, 60 and 70 eggs and increases in either egg number (EN) or egg mass (EM) in the 1<sup>st</sup>, 2<sup>nd</sup> and two months of production and egg weight ( $EW_1$ ,  $EW_{10}$ ,  $EW_{30}$ ,  $EW_{60}$  and  $EW_{70}$ ), respectively. Higher expected direct genetic response (EDGR) to selection for high  $BW_{21}$  for males, females and the combined sexes (4.23, 4.67 and 4.36 vs. 2.80, 2.58 and 1.96g, respectively) for the SL lines than the SN line were shown based on sire variance component. The realized direct responses to selection were significantly higher than their EDGR for all sex groups studied. As generation number increased, each of  $BW_{21}$  of the SN followed by SL increased by 9.34 and 9.12g. Selection for high  $BW_{21}$  indicating a symmetrical response between the selected lines with higher positive average realized direct phenotypic (ADPR) than genetic (ADGR) than EDGR responses for the combined sexes. Both females and males had a symmetrical responses - ADGR/G and ADPR/G- in the same positive direction but differed in magnitude where males of either SN or SL had higher ADGR/G than females. In contrast, females had higher ADPR/G than males in the selected lines for higher  $BW_{21}$ . The increase in generation number significantly resulted in increases of 0.27, 4.00, 7.10 and 5.46g, respectively in  $BW_1$ ,  $BW_{14}$ ,  $BW_{28}$  and  $BW_{35}$  favoring  $G_3$ . The SN line had the highest  $BW_{35}$  (186.97), and insignificantly affected than the SL line in both  $BW_{14}$  and  $BW_{28}$  (65.82 vs. 66.51 and 147.35g vs. 147.55). Selection for high  $BW_{21}$  resulted in attaining sexual maturity at later ages, the  $G_3$  had significantly later ASM of 55.94 days than other generations and had heavier EW's of 10.62, 12.47, 12.76, 12.85 and 12.90g, respectively, desirable decrease in both  $DN_{10}$  and  $DN_{30}$  (11.71 and 37.59 days) for SN line. The heaviest  $EM_{10}$  of 118.84g was shown for the SN line and laid heavier  $EW_{10}$ ,  $EW_{60}$  and  $EW_{70}$  (12.14, 13.10 and 12.98g, respectively), and increasing  $EM_{2M}$  and  $EM_{1+2M}$  being 299.66 and 597.39 for SL. Females of the SN line had heavier  $EM_{10}$  and  $EM_{1M}$  (118.84 and 306.48g). There were insignificant differences among correlated responses of the SL and SN lines for  $BW_{35}$ , ASM, EN, EM, EW and DN at all tested periods. The values of the average realized heritability estimates

( $Rh^2$ 's) were 0.53, 0.55 and 0.54 for females, males and combined sexes of the SN line and 0.61, 0.67 and 0.60 for the SL line, respectively.

**2. Testing phase:** Line significantly affected BW at all ages studied, daily gains (DWG), growth rates (GR), daily feed intake (DFI), feed conversion (FC) during most studied periods, economic efficiency (EEf) and relative economic efficiency (REEf%) however, insignificantly affected mortality% during all studied periods of growth. There were symmetrical responses for BW's, DWG's and GR's within both groups the selected and controls lines, regardless of CP% tested. The SN line had the highest  $GR_{1-35}$  (180.89%) followed by the SL (180.52%), than their controls. Selection for high  $BW_{21}$  resulted in low FI during the periods followed age of selection in the SN line. The higher FI of low protein diet during all the periods of growth allowed the SL line to compensate the low protein effect and resulted in higher GR's. The FC's for both CL and SL were inferior to those of both CN and SN during all studied periods. Therefore, the low protein diet (20%CP) was considered inferior to the normal diet (24%CP) environment for the expression of optimal short-term genetic improvement of growing Japanese quail. Economically, the SN line had the highest EEf and REEf% (2.47 and 125.85%) followed by the SL (2.17 and 110.26%). The REEf% of the SN line was superior than the SL line by 15.59%. The SN line ( $P>0.05$ ) had the lowest mortality % followed by the SL during the period from 7 to 35 days of age which might be attributed to improve livability due to selection. There were asymmetrical sex responses for BW's, DWG, GR's, FC's, EEf and REEf %, favoring females which surpassed their males by 10.83% REEf. Line seemed to have independent effects than sex on most growth performance traits studied and no significant effects of feed restriction were detected on REEf % considered between the SN and SL lines whereas both selected lines significantly surpassed either CN or CL lines. In conclusion, it seemed possible to use the 20% CP and 2900kcal ME as a tolerable alternative choice to the optimum normal 24% CP and 2900kcal ME for the selected quail for high  $BW_{21}$  especially in the countries like Egypt suffering from shortage of protein sources in poultry feeds without causing harmful effects in terms of BW, DWG, GR%, mortality% and economic efficiency traits.

**Key words:** Selection, high body weight, two nutritional environments, Japanese quail.