EFFECT OF SEX-LINKED FEATHERING GENES ON BODY WEIGHT,AGE AT SEXUAL MATURITY, FEED INTAKE AND SUBSEQUENT LAYING PERFORMANCE OF BALADI CHICKENS

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Abstract. A total of 320 twenty weeks-old slow and rapid feathering Saudi Arabian Baladi pullets were used to assess the effect of sex-linked feathering genes on body weight, age at sexual maturity, feed intake and subsequent laying performance. Similar number of rapid feathering Leghorns pullets were included in the study for the purpose of comparison. The experimental birds of each genotypic group were randomly divided into four replicates and subjected to standard management practices.

Slow feathering Baladi had higher ($P < .05$) adult body weight, rate of mortality and feed intake and similar age at sexual maturity but showed lower ($P < .05$) hen-day and hen-housed egg production and feed conversion compared with rapid feathering Baladi.Rapid feathering Leghorns had significantly ($P < .05$) higher adult body weight, age at sexual maturity, hen-day egg production, rate of mortality and feed intake and lower feed intake/kg eggs than rapid and slow feathering Baladi. However, rapid feathering Baladi and Leghorns showed statistically similar hen-housed egg production and feed intake/dozen eggs and had better ($P < .05$) performance than slow feathering Baladi with regard to those traits. From the results of this study it seems that sex-linked feathering genes influence most of the studied traits.

Introduction

The relationship of sex-linked feathering genes with adult body weight, age at sexual maturity and subsequent laying performance have been studied by many investigators. Adult body weight seems not to be affected by these genes as reported by many investigators (Hays and Sanborn, 1929; Lowe and Garwood, 1981,Dunnington and Siegel, 1986, Al-Abdullatif, 1994). An exception was the finding of Katanbaf et al. (1989a) who reported higher body weight for slow feathering compared with rapid feathering hens at 446 days of age. With respect to other traits, several researchers revealed no significant feathering genotype effect upon age at sexual maturity (Hays and Spear, 1951; Lowe and Garwood, 1981; Kotaiaht 1981; Dunnington and Siegel, 1986), egg production (Hays and Sanborn,1929, Merat, 1967; Lowe and Garewood, 1981, Kotaiaht 1981; Dunnington and Siegel, 1986) and laying house mortality (Hays and Sanborn,1929, Havenstein et al. 1989). On the other hand, some others reported that rapid feathering pullets matured earlier (Lowe, et al. 1965; Merat, 1967; Harris, et al. 1984; O'Sullivan et al. 1991) had higher egg production (Lowe and Garwood, 1981; Harris et al. 1984;Katanbaf, et al. 1989b; O'Sullivan et al. 1991) lower laying house mortality (Lowe and Garwood, 1981; Kotaiaht, et al. 1981; Harris, et al.1984) and consumed less feed (Kotaiaht, 1981). Informations on the effect of feathering genes on feed conversion are lacking and those obtained with respect to other traits are not consistent, therefore this study was conducted to assess the effect of sex-linked feathering genes on adult body weight, age at sexual maturity and subsequent laying performance of Saudi Arabian Baladi chicken and to compare their performance with that of rapid feathering Leghorns.

Materials and Methods

Slow and rapid feathering Saudi Baladi were obtained from the Baladi population which has been randomly bred for several years in the Experimental Poultry and Live-stock Farm of the Animal Production Department, College of Agriculture, King Saud University. Hundred sixty 20 weeks-old pullets of each genotypic group were used in this study. The birds in each genotypic group, were leg-banded and randomly allotted to four floor pens, 40 birds in each pen in an environmentally controlled house. Each floor pen was considered as a replicate. Similar number of early feathering Leghorns which has been bred under similar conditions for many years, were included in the study for the purpose of comparison. The birds received water and the commercial laying ration described in Table 1 ad-libtum throughout the experimental period. Light was increased by half an hour weekly and then maintained constantly at 15 h light : 9 h dark. The trial lasted nine 28 days production period. Individual body weights were measured to the nearest gram at the start (20 wks), 30, 40 and 50 weeks of age and at the end of the experimental period (60 wks). Egg production was daily recorded to calculate hen-day and hen-housed egg production. Eggs of each replicate were collected for three consecutive days during the last week of each production period and individually weighed to the nearest .01 gram. Feed intake per pen basis was biweekly obtained to calculate feed intake per hen per day (F/B/D) and feed conversion (kg feed/dozen eggs ;F/DE: and kg feed/kg eggs ;F/KgE). Daily mortality was also recorded and feed lost was taken into consideration during the whole experimental period.

Data collected were subjected to statistical analysis using SAS general liniar model (GLM) procedure, King Saud University, Computer Center, according to the following statistical model:

$$Y_{ijk} = U + G_i + P_j + (GP)_{ij} + e_{ijk}$$

Where the y_{ijk} is the kth observation of the ith genotype (G) jth production period (P). $(GP)_{ij}$ is the interaction between genotype(G) and production period (P). U is the general mean and e_{ijk} is the random error associated with the y_{ijk} observation (SAS ,1986)

Results

Body Weight (BW). As it is indicated in Table 2 genotype (G) and age (A) effects were significant at the .01 level of probability whereas that of their interaction (G*A) was significant at the .05 level of probability. Rapid feathering Baladi (RB) had significantly ($P < .05$) lower BW than their slow feathering Baladi (SB) counterparts. However rapid feathering Leghorns (RL) had significantly ($P < .05$) the highest BW (Table 2). BW increased with age and significantly ($P < .05$) reached its highest value at 50 weeks of age (Table2). With respect to(G*A) effect, rapid feathering Baladi(RB) had significantly ($P<.05$) the lowest BW at all age periods, whereas rapid feathering Leghorns (RL) and slow feathering Baladi (SB) had significantly ($P<.05$) the highest BW at the four last age periods but at the first period, slow feathering Baladi (SB) showed significantly ($P<.05$) lower weight than rapid feathering Leghorns(Fig. 1).

Age at Sexual Maturity (SM). Table 2 shows that genotype (G) effect was significant ($P < .01$) upon age at sexual maturity (SM). However there was no significant difference between early and late feathering Baladi with respect to SM whereas rapid feathering Leghorns (RL) had significantly ($P < .05$) the highest SM (Table 2).

Hen-Day and Hen-Housed Egg Production (HD and HH). Genotype (G), production period (P) and their interaction (G*P) effects were significant ($P < .01$) for hen-day and hen-housed egg production (Table 3). Slow feathering Baladi (SB) had significantly ($P < .01$) lower HD than rapid feathering Baladi (RB) whereas rapid feathering Leghorns (RL) had significantly ($P < .01$) the highest HD (Table 3). With respect to HH slow feathering Baladi (SB) had significantly ($P < .01$) lower HH than rapid feathering Baladi (RB), whereas there was no significant difference between rapid feathering Baladi (RB) and Leghorns (RL). Table 3 also illustrates that HD and HH significantly ($P < .05$) increased up to the end of the second production period thereafter gradually decreased and significantly ($P < .05$) reached its lowest value at the last production period. However the rate of increase and decrease have nearly similar trend for HD and HH. Fig.2 and 3 show that slow feathering Baladi (SB) and rapid feathering Leghorns had significantly (P < .05) the lowest and highest HD and HH values most of the production periods, respectively. However, rapid feathering Baladi (RB) had significantly (P < .05) the highest HH at the first and second and the highest HD only at the second production periods.

Mortality (M). As stated in Table 3 genotype (G), production period (P) and their interactions (G*P) effects were significant (P< .01). Rapid feathering Baladi (RB) had significantly (P < .01) lower mortality than their slow feathering peers (SB) whereas rapid feathering Leghorns (RL) had significantly (P < .01) the highest mortality (Table 3). Mortality sharply and significantly (P<.05) increased at the four first production periods, thereafter the rate of increase declined upto the last production period (Table 3). Fig. 4 indicates that rapid feathering Baladi (RB) had significantly (P<.05) the lowest mortality rates during most of the production periods whereas rapid feathering Leghorns (RL) had significantly (P<.05) the highest rate during the first and second production periods. However, mortality rates of slow feathering Baladi (SB) and Leghorns (RL) were statistically similar most of the production periods (Fig. 4).

Feed Intake (gm F/B/D). Table 3 shows that genotype (G), production period (P) and their interactions (G*P) effects were significant (P < .01). Slow feathering Baladi (SB) had significantly (P<.05) higher feed intake than their rapid feathering counterparts (RB) whereas rapid feathering Leghorns (RL) significantly (P<.05) consumed the highest amount of feed (Table 3). Feed intake was statistically similar during the 5th to the 8th production periods and was significantly (P < .05) higher than that of the first four and lower than that of the last production periods. Feed intake was also significantly (P < .05) lower at the fourth than at the third production period (Table 3).As can be observed from Fig. 5 rapid feathering Leghorns (RL) significantly (P < .05) showed the highest feed intake during most of the production periods, whereas slow (SB) and rapid (RB) feathering Baladi had statistically similar feed intake at most of the production periods.

Feed Conversion (Kg F/DE, Kg F/KgE). Genotype (G) and production period (P) effects were significant at the level of .01 and that of their interaction at the level of .05 of probability, with regard to F/DE and F/KgE (Table 3). Slow feathering Baladi (SB) had significantly ($P < .05$) the worst F/DE and F/KgE values compared with those of rapid feathering Baladi (RB), which significantly ($P < .05$) lagged behind Leghorns (LR) only with regard to F/KgE (Table 3). F/DE significantly ($P < .05$) reached its best value at the 2nd, 3rd and 4th production periods and its worst value at the 1st, 8th and 9th production periods, whereas F/KgE was significantly ($P < .05$) the worst at the first production period and the best during the 2nd, 3rd, 4th production periods (Table 3). With regard to the effect of G*P on F/DE, the different genotypes had statistically similar values at most of the production periods, however slow feathering Baladi (SB) had significantly ($P < .05$) the worst value at the 6th, 8th and 9th production periods and rapid feathering Leghorns (RL) at the first production period (Fig. 6). F/KgE was statistically similar for the different genotypes at the first two production periods but slow feathering Baladi (SB) had significantly ($P < .05$) the worst F/KgE during the last four production periods whereas rapid feathering Baladi (RB) and Leghorns (RL) had statistically similar values most of the production periods (Fig. 7).

Discussion

Slow feathering Baladi (SB) had significantly ($P < .05$) higher adult body weight than their rapid feathering counterparts. These results disagree with those of Hays and Sanborn, 1929; Lowe and Garwood, 1981; Dunnington and Siegel, 1986 and Al-Abdullatif, 1994 who observed no significant adult body weight differences between the two genotypes but were similar to that stated by Katanbaf et al. (1989a) who noticed higher body weight for slow feathering compared with rapid feathering hens at 446 days of age. Rapid and slow feathering Baladi had similar age at sexual maturity. Similarly was reported by several investigators (Hays and Spear, 1951; Lowe and Garwood, 1981; Kotaiaht, 1981; Dunnington and Siegel, 1986). However, our results disagree with those of Lowe et al. 1965; Merat, 1967; Harris, et al. 1984 and O'Sullivan et al. 1991 who reported that rapid feathering pullets matured earlier. Rapid feathering Baladi had higher ($P < .05$) hen-day and hen-housed egg production than their slow feathering peers. Similar results were reported by Lowe and Garwood, 1981; Harris et al. 1984; Katanbaf et al. 1989b and O'Sullivan et al. 1991. However our results disagree with those of Hays and Sanborn, 1929; Merat, 1967; Lowe and Garwood 1981; Kotaihat 1981 and Dunnington and Siegel; 1986 who showed no significant feathering genotype effect upon egg production. Rapid feathering Baladi had lower ($P < .05$) laying house mortality than their slow feathering peers. Similar results were reported by Lowe and Garwood, 1981; Kotaiaht et al. 1981 and Harris et al. 1984. However our results disagree with those of Hays and Sanborn, 1929 and Havenstein et al.,1989 who found statistically similar mortality rates for rapid and slow feathering birds. Slow feathering Baladi had higher ($P < .05$) feed intake per bird per day than their rapid feathering counterparts. Similar results were reported by Kotaiaht (1981) who observed higher feed intake per bird per day for slow than rapid feathering hens.

The information on the relationship of feathering genotype on feed conversion calculated as Kg feed intake per dozen eggs (KgF/DE) or as Kg feed intake per Kg eggs (KgF/KgE) are lacking. Our study shows that rapid feathering had significantly ($P < .05$) better feed conversion compared with slow feathering Baladi. On the other hand, slow and rapid feathering Baladi lagged behind rapid feathering Leghorns with respect to most studied traits.

From the results of this study it seems that sex-linked feathering genes influence most of the studied traits.

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