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RR Patel
Anand Agricultural University, Anand, Gujarat, India

JH Patel
Anand Agricultural University, Anand, Gujarat, India

FP Savaliya
Anand Agricultural University, Anand, Gujarat, India

AB Patel
Anand Agricultural University, Anand, Gujarat, India

NJ Bhagora
Anand Agricultural University, Anand, Gujarat, India

Corresponding Author:
RR Patel
Anand Agricultural University, Anand, Gujarat, India

Evaluation of production performance of various economic traits of two strains of white leghorn chicken

RR Patel, JH Patel, FP Savaliya, AB Patel and NJ Bhagora

Abstract
The present study was planned to evaluate the various economic traits of two strains of white leghorn chicken. The experiment was carried out in 12th and 22nd generations of Anand Bantamized White Leghorn (ABWLH) and Anand Synthetic White Leghorn (ASWLH) strains of White Leghorn, respectively. Various traits like body weight (BW) at day old, 4, 8, 12, 16, 20, 28 and 40 weeks of age, age at first egg (AFE), total egg number produced upto 40 weeks of age (TEN40), egg weight (EW) at 24, 28, 32, 36 and 40 weeks of age and total egg mass produced upto 40 weeks of age (TEM40) were measured and utilized for estimation of least square mean and standard error. The ASWLH strain has significantly (p<0.05) higher body weight at day old, 12, 16, 20 and 28 weeks of age compared to the ABWLH strain. The least square means and standard error of AFE (days) was 135.81±0.68 and 141.77±0.91 in ABWLH and ASWLH strains, respectively. Age at first egg of ASWLH strain was significantly (p<0.05) higher than ABWLH strain. The least square mean and standard error for TEN40 was 121.98±0.88 in ABWLH and 110.30±0.95 in ASWLH strain. The strain ABWLH has produced significantly (p<0.05) higher egg number produced upto 40 weeks of age than ASWLH strain. The mean egg weight recorded at all ages was significantly (p<0.05) higher in ASWLH strain as compare to ABWLH strain. The least square mean and standard error for TEM40 was 5903.76±41.48 in ABWLH and 5822.92±46.84 in ASWLH strain. The egg mass produced upto 40 weeks of age by both strains differed non-significantly. This results due to the selection for the negatively correlated traits in different strains.

Keywords: White leghorn, economic traits, production performance

Introduction
Poultry sector is playing key role to fulfil the goals of food security as well as targets of Indian economy. Increased consumption with population growth has increased the demand of poultry products. To fulfil this higher demand poultry sector is also growing rapidly, which makes the poultry sector the fastest growing sub-sector of Indian agriculture. Relentless efforts and concerted research in poultry breeding has led to the evolution of high producing layer stocks suited for different environment and management practices.
The present investigation was undertaken to evaluate and to compare the various economic traits of Anand Bantamized White Leghorn (ABWLH) and Anand Synthetic White Leghorn (ASWLH) upto the age of 40 weeks. The both strains, ABWLH and ASWLH had been released by Anand Agricultural University; and were continuously under selection for egg production traits since last 11 and 21 generations, respectively at Poultry Research Station, College of Veterinary Science and Animal Husbandry, Anand Agricultural University, Anand.

Materials and Methods
The experiment was carried out in 12th and 22nd generations of ABWLH and ASWLH strains of White Leghorn, respectively. Pedigreed chicks were generated by mating of 50 sires with 250 dams of each of ABWLH and ASWLH strains of White Leghorn and were used as experimental material. At 16 weeks of age, 372 and 340 pullets of ABWLH and ASWLH strains were housed in Individual California Cage System for recording individual performance, out of which 357 ABWLH and 324 ASWLH pullets have been contributed upto 40 weeks of age. So, the liveability of ABWLH and ASWLH strains recorded at 40 weeks of age were 95.97 percent and 95.29 percent, respectively. The birds having complete information at 40 weeks of age were used for statistical analysis. Extremely abnormal records were eliminated.

Various economic traits like body weights (g) recorded at day old (BW0), 4th (BW4), 8th (BW8), 12th (BW12), 16th (BW16), 20th (BW20), 28th (BW28) and 40th (BW40) week of age, age at first egg (AFE)**,** total egg production upto 40 weeks of age (TEN40), egg weights recorded for three eggs per hen per week at 24th (EW24), 28th (EW28), 32nd (EW32), 36th (EW36), and 40th (EW40) week of age; and total egg mass upto 40 weeks of age (TEM40) was considered for analysis.

The least squares means of various economic traits were estimated by using "Least-Squares Analysis" procedure explained by Harvey (1966) [4]. The differences between two strains for various economic traits were calculated using t-test (Snedecor and Cochran, 1994) [12].

Results and Discussion

The least square means (LSMs) and standard error of growth and various economic traits of ABWLH and ASWLH strains are presented in Table 1 and Table 2.

Table 1: Least square means and standard error of body weight at different ages of ABWLH and ASWLH strains.

Traits	Strains		Significance (At 5%)
	ABWLH (N=355)	ASWLH (N=310)	
BW0 (g)	38.39±0.18	39.65±0.19	S
BW4 (g)	200.75±1.56	203.22±1.42	NS
BW8 (g)	537.39±2.91	531.64±2.66	NS
BW12 (g)	835.39±3.74	859.88±3.75	S
BW16 (g)	1091.65±4.57	1107.62±4.72	S
BW20 (g)	1235.55±4.92	1254.44±5.00	S
BW28 (g)	1365.59±6.42	1409.02±7.07	S
BW40 (g)	1544.07±8.23	1532.66±9.37	NS

(S= Significant, NS= Non-significant)

The least square means and standard error for body weight (g) at day old, 4, 8, 12, 16, 20, 28 and 40 weeks of age were 38.39±0.18, 200.75±1.56, 537.39±2.91, 835.39±3.74, 1091.65±4.57, 1235.55±4.92, 1365.59±6.42 and 1544.07±8.23 in ABWLH strain and 39.65±0.19, 203.22±1.42, 531.64±2.66, 859.88±3.75, 1107.616±4.72, 1254.435±5.00, 1409.023±7.07 and 1532.655±9.37 in ASWLH, respectively.

The ASWLH strain has significantly (p<0.05) higher body weight at day old, 12, 16, 20 and 28 weeks of age compared to the ABWLH strain. The ABWLH strain was developed for improved feed efficiency without affecting egg production and for that Bantam breed was crossed with White Leghorn breed. In ABWLH strain, the lower body weight may be due to the influence of the bantam gene.

The findings of BW16 in ABWLH and ASWLH strains are in accordance with Anees *et al.* (2010) [1] and Savaliya *et al.* (2014) [11], respectively. Qadri *et al.* (2013) [9] reported mean value for BW20 and BW28 which is comparable to present study. The similar findings to ABWLH and ASWLH strains for BW40 were observed by Churchil *et al.* (2019) [3] and Paleja *et al.* (2008) [7], respectively. However, Sreenivas *et al.* (2012) [13] reported lower mean values of BW40 whereas Savaliya *et al.* (2014) [11] reported higher mean values than present findings.

Table 2: Least square means and standard error of various egg production traits of ABWLH and ASWLH strains.

Traits	Strains		Significance (At 5%)
	ABWLH (N=355)	ASWLH (N=310)	
AFE (days)	135.81±0.68	141.77±0.91	S
TEN40	121.98±0.88	110.30±0.95	S
EW24 (g)	44.29±0.14	45.75±0.17	S
EW28 (g)	46.34±0.15	50.91±0.18	S
EW32 (g)	48.75±0.15	51.95±0.19	S
EW36 (g)	51.03±0.10	53.74±0.12	S
EW40 (g)	51.93±0.17	56.08±0.22	S
TEM40 (g)	5903.76±41.48	5822.92±46.84	NS

(S= Significant, NS= Non-significant)

The least square mean and standard error of AFE (days) was 135.81±0.68 and 141.77±0.91 in ABWLH and ASWLH strains, respectively. Age at first egg of ASWLH strain was significantly (p<0.05) higher than ABWLH strain. The similar findings to ABWLH and ASWLH strains were observed by Veeramani *et al.* (2012) [15] in IWN strain and Laxmi *et al.* (2010a) [6], respectively. However, Tomar *et al.* (2015) [14] and Churchil *et al.* (2019) [3] reported higher AFE whereas Karuppasamy *et al.* (2018) [5] reported lower AFE than present study.

The least square mean and standard error for TEN40 was 121.98±0.88 in ABWLH and 110.30±0.95 in ASWLH strain. The strain ABWLH has produced significantly (p<0.05) higher egg number produced upto 40 weeks of age than ASWLH strain. In development of ABWLH strain, to maintain commercial egg production characteristics, IWP and IWN strains of White Leghorn were crossed with Bantam breed. The similar findings to ABWLH and ASWLH strains were observed by Patil *et al.* (2018) [8] in IWN strain and Laxmi *et al.* (2010a) [6], respectively. However, Barot *et al.* (2008a) [2] reported lower TEN40, whereas Karuppasamy *et al.* (2018) [5] reported higher TEN40 than present findings.

The least square means and standard error for egg weight (g) at 24, 28, 32, 36 and 40 weeks of age were 44.29±0.14, 46.34±0.15, 48.75±0.15, 51.03±0.11 and 51.93±0.17 for ABWLH strain and 45.75±0.17, 50.91±0.18, 51.95±0.19, 53.74±0.13, 56.08±0.22 for ASWLH strain, respectively. The mean egg weight recorded at all ages was significantly (p<0.05) higher in ASWLH strain as compare to ABWLH strain. In ASWLH strain, the result shows the fulfilment of

the objective of higher egg weight, behind its development. Patil *et al.* (2018) [8] reported mean value for EW24 and EW28 which is comparable to present study. The findings of EW32 in both strains are in accordance with Barot *et al.* (2008a) [2]. The similar to present findings for EW36 were observed by Patil *et al.* (2018) [8] whereas Rosa *et al.* (2018) [10] reported higher mean values. The findings of EW40 in ABWLH and ASWLH strains are supported by findings of Karuppasamy *et al.* (2018) [5] and Churchil *et al.* (2019) [3], respectively.

The least square mean and standard error for TEM40 (g) was 5903.76±41.48 in ABWLH and 5822.92±46.84 in ASWLH strain. The egg mass produced upto 40 weeks of age by both strains differed non-significantly. The results show that ABWLH strain has comparatively higher egg number and low egg weight, whereas ASWLH strain has comparatively higher egg weight and low egg number, which ultimately leads to non-significant difference in total egg mass production. Similar to present findings of TEM40 of both the strains reported by Paleja *et al.* (2008) [7] in S2 and S6 generations of IWN strain. However, Qadri *et al.* (2013) [9] and Tomar *et al.* (2015) [14] reported lower TEM40.

Conclusions

From the present study, it was noticed that, overall Anand Synthetic White Leghorn strain has significantly (p<0.05) higher body weight as compare to the Anand Bantamized White Leghorn strain. In Anand Bantamized White Leghorn strain, the lower body weight may be due to the influence of the bantam gene. Anand Bantamized White Leghorn strain has significantly (p<0.05) lower age at first egg than Anand Synthetic White Leghorn strain, and as a result it produces significantly (p<0.05) higher egg number upto 40 weeks of age. The mean egg weight recorded at all ages is significantly (p<0.05) higher in Anand Synthetic White Leghorn strain as compare to Anand Bantamized White Leghorn strain. The difference in egg mass produced up-to 40 weeks of age by both strains is at par. This results due to the selection for the negatively correlated traits in different strains.

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