A Study on Biometrical Measurements of Two Broiler Rabbit Genetic Groups APAU-FAWN & BLACK

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Abstract

Data on growth of bunnies born in to 112 litters of two synthetic rabbit genetic groups APAU Fawn (FN) and APAU Black (BL), were utilized for the present investigation to evaluate influence of genetic and non-genetic factors on Linear Biometrical Measurements. Genetic group had a significant effect on body length, chest girth, ear length at all ages studied, wherein FN measured better compared to BL rabbits. The overall least squares means from 4 week to 16 week ranged from 22.03 ± 0.12 to 31.73 ± 0.18 cm for body length; 16.90 ± 0.08 to 24.63 ± 0.09 cm for chest girth; 18.04 ± 0.10 to 25.98 ± 0.10 for paunch girth; 7.19 ± 0.04 to 10.51 ± 0.05 for ear length and 4.43 ± 0.03 to 6.02 ± 0.22 cm for ear width.

Key words: Bio-metrical Measurement, Genetic Group, Body Length, Chest Girth

Growth rate and body size of animals are often viewed as two correlated traits that change until maturity (Arango *et al*. 2004). Linear Bio-metrical measurements have often been used as a means of describing the shape and size of farm animals, characterizing breed and evaluating their performance (Brown *et al*. 1956). The present study aims at evaluating genetic and non-genetic factors influencing Linear Bio-metrical Measurements in two synthetic rabbit genetic groups, namely APAU-Fawn and APAU-Black, evolved from Grey Giant and New Zealand White in F_2 and further generations at "Rabbit Research Centre", Department of Animal Genetics and Breeding, College of Veterinary Science, Hyderabad, Telangana. Selective breeding within genetic groups was carried out for breed stabilization and to exploit within breed genetic variation for economic traits in rabbits.

Materials & Method

The synthetic rabbit genetic groups were reared under uniform environmental conditions with proper ventilation and a temperature range of 28-30°C. About 100-150 g of concentrate mixture was fed daily and supplemented with Alfalfa green fodder. Clean drinking water was provided throughout the day using nipple drop system. Linear measurements were measured in centimeters on each individual at fortnightly intervals starting from 4 to 16 weeks of age with measuring tape. For measuring length, the bunny was laid on its lateral recumbent posture and to measure chest girth and paunch girth it was laid on sterno-recumbent posture. Body length was recorded as the distance from forehead to the base of the tail, chest girth was measured as the body circumference behind the elbow joint, while the body circumference just anterior to the pelvis was recorded as paunch girth. The distance from base to the tip of the ear flap was considered as ear length and the maximum width of the ear flap was regarded as the ear width. Data generated for growth trait was subjected to least squares analysis using Proc (Procedure) GLM (General Linear Model) of SPSS (Statistical Package for Social Sciences) 15.0 and the data were corrected for significant non-genetic effects (Season of birth).

Results

Body Length: Genetic group had a significant effect on body length at all ages studied, whereas, the effects of sex of bunny and season of birth were found to be non-significant, studied at all ages. The overall least squares means for body length ranged from 22.03 ± 0.12 cm at 4 weeks to 31.73 ± 0.18 cm at 16 week of age. The FN rabbits were significantly longer than BL rabbits at all ages and the mean body length at 4, 6, 8, 10, 12, 14 and 16 weeks of age were 22.52 ± 0.16, 24.48 ± 0.17, 26.19 ± 0.14, 28.75 ± 0.20, 29.87 ± 0.25, 31.62 ± 0.19 and 32.10 ± 0.23 cm in FN rabbits and 21.55 ± 0.15, 23.81 ± 0.17, 25.81 ± 0.14, 27.73 ± 0.17, 28.80 ± 0.21, 30.17 ± 0.22 and 31.36 ± 0.24 cm in BL rabbits respectively (Table 1, 2, 3).

Chest Girth: Genetic group exerted significant influence on chest girth at 4, 8, 14, 16 weeks of age only, while sex of bunny and season of birth did not influence chest girth at all ages studied. The overall least squares means for chest girth ranged from 16.90 ± 0.08 at 4 weeks to 24.63 ± 0.09 cm at 16 weeks of age. The FN rabbits recorded longer chest girth compared to BL at 4, 8, 14 and 16 weeks of age and mean chest girth at 4, 6, 8, 10, 12, 14 and 16 weeks of age were, 17.09 ± 0.11, 19.04 ± 0.12, 20.74 ± 0.11, 21.85 ± 0.14, 22.77 ± 0.16, 23.69 ± 0.10 and 24.42± 0.11 cm in FN rabbits and 16.71, 18.72 ± 0.12, 20.34 ± 0.10, 21.56 ± 0.11, 22.75 ± 0.14, 24.02 ± 0.12 and 24.85± 0.12 cm in BL rabbits (Table 1, 2, 3).

Paunch Girth: Paunch girth at 6, 8 and 16 weeks of age was significantly influenced by genetic group but not by the sex of bunny and season of birth. The overall least-squares means for paunch girth at 4, 6, 8, 10, 12, 14 and 16 weeks of age were 18.04 ± 0.10, 20.73 ± 0.09, 22.66 ± 0.12, 23.63 ± 0.13, 24.40 ± 0.16, 25.51 ± 0.10 and 25.98 ± 0.10 cm, respectively. Paunch girths were significantly heavier at 6, 8, and 16 weeks of age for FN rabbits compared to black. Mean paunch girth at 4, 6, 8, 10, 12, 14 and 16 weeks of age were 18.13 ± 0.13, 21.12 ± 0.12 , 23.01 ± 0.15 , 23.67± 0.18 , 24.41 ± 0.20 , 25.54 ± 0.12 , 25.79± 0.12 cm for FN rabbits and corresponding values for BL rabbits were 17.94 ± 0.13 , 20.35 ± 0.12 , 22.31 ± 0.15 , 23.60 ± 0.15 , 24.39 ± 0.17 , 25.48 ± 0.14 , 26.17 ± 0.13 cm, respectively (Table 1, 2, 3).

Ear Length: Genetic group had significant effect on ear length at all post-weaning ages studied, while effects of sex of bunny and season were found to be non-significant. Overall least-squares means for ear length were 7.19 ± 0.04, 8.69 ± 0.04, 9.18 ± 0.04, 9.67 ± 0.05, 10.03 ± 0.06, 10.35 ± 0.04 and10.51 ± 0.05 cm at 4, 6, 8, 10, 12,

Table 1. Least-squares means (cm) for biometrical measurements at 4 and 6 weeks of age

	n	4 Weeks					n	6 Weeks				
		BLN	CG	PG	EL	EW		BLN	CG	PG	EL	EW
Overall	215	22.03 ±0.12	16.90 ±0.08	18.04 ± 0.10	7.19 ± 0.04	4.43± 0.03	214	24.15± 0.13	18.88±0.09	20.73±0.09	8.69±0.04	4.88 ± 0.02
Genetic group												
Fawn	105	22.52^{a}± 0.16	17.09^{a}±0.11	18.13 ± 0.13	8.01^{a}± 0.06	4.55^{a}±0.04	104	24.48^{a}±0.17	19.04 ±0.12	21.12^{a}±0.12	8.74 ±0.06	4.87 ± 0.03
Black	110	21.55^{b}± 0.15	16.71^{b}±0.10	17.94 ± 0.13	7.79^{b}±0.06	4.32^{b}±0.04	110	23.81^{b}±0.17	18.72 ±0.12	20.35^{b}±0.12	8.64 ±0.05	4.90 ± 0.03
Season of birth												
Summer	69	22.04± 0.18	17.03±0.12	18.09± 0.15	7.99± 0.07	4.48±0.04	69	24.11±0.19	18.88±0.14	20.71±0.14	8.65±0.06	4.81± 0.04
Rainy	27	22.33 ± 0.29	16.47±0.19	17.92 ±0.24	7.90 ± 0.11	4.42±0.07	27	24.34±0.31	18.87±0.22	20.88±0.22	8.77±0.10	4.99± 0.06
Winter	119	21.73±0.14	16.93±0.09	18.10±0.17	7.85 ± 0.05	4.40±0.03	118	23.99±0.15	18.89±0.11	20.62±0.10	8.66±0.05	4.85± 0.03
Sex of bunny												
Male	87	22.12 ± 0.17	16.97 ±0.11	18.02 ± 0.14	7.94 ± 0.06	4.45 ±0.04	87	24.13 ±0.18	18.86 ±0.13	20.77 ±0.13	8.73 ±0.06	4.87 ± 0.03
Female	128	21.95 ± 0.15	16.83 ±0.10	18.05 ± 0.13	7.88 ± 0.06	4.41 ±0.04	127	23.98 ±0.16	18.88 ±0.12	20.69 ±0.12	8.66 ±0.05	4.89 ± 0.03

Means with dissimilar superscripts within each column under each effect differ significantly

Table 2. Least-squares means (cm) for biometrical measurements at 8 and 10 weeks of age

	n	8 Week					n	10 Week				
		BLN	CG	PG	EL	EW		BLN	CG	PG	EL	EW
Overall	205	26.00±0.10	20.54 ±0.08	22.66 ±0.12	9.18 ± 0.04	5.13± 0.02	184	28.24±0.15	27.71± 0.10	23.63 ± 0.13	9.67± 0.05	5.36± 0.03
Genetic group												
Fawn	103	26.19^{a} ± 0.14	20.74^{a}±0.11	23.01^{a}±0.15	9.35^{a} ± 0.05	5.13 ± 0.03	91	28.75^{a} ± 0.20	21.85 ± 0.14	23.67± 0.18	9.92^{a} ± 0.06	5.36± 0.05
Black	102	25.81^{b} ± 0.14	20.34^{b}±0.10	22.31^{b}±0.15	9.01^{b} ± 0.05	5.14 ± 0.03	93	27.73^{b}± 0.17	21.56 ± 0.11	23.60 ± 0.15	9.60^{b} ± 0.05	5.37 ± 0.04
Season of birth												
Summer	62	25.88±0.16	20.50±0.13	22.49±0.18	9.11± 0.06	5.07±0.04	54	28.44 ± 0.20	21.73±0.13	23.63 ± 0.17	9.75± 0.06	5.44 ± 0.04
Rainy	27	26.11± 0.25	20.69±0.19	22.92±0.28	9.21± 0.19	5.18±0.06	15	28.16 ± 0.39	21.66±0.26	23.68± 0.35	9.77 ± 0.13	5.26 ± 0.09
Winter	116	26.01± 0.12	20.43±0.09	22.57±0.13	9.21± 0.04	5.15±0.03	115	28.13±0.13	21.69 ±0.09	23.55± 0.12	9.76 ± 0.04	5.39 ± 0.03
Sex of bunny												
Male	85	26.09 ± 0.14	20.53 ±0.11	22.65± 0.16	9.21 ± 0.05	5.13 ± 0.04	75	28.31 ±0.19	21.77 ± 0.13	23.72 ± 0.17	9.78 ± 0.06	5.37 ± 0.04
Female	120	25.93 ± 0.13	20.55 ±0.10	22.67 ±0.15	9.15 ± 0.05	5.13 ± 0.03	109	28.71 ± 0.18	21.64 ± 0.12	23.55± 0.16	9.74 ± 0.06	5.35 ± 0.04

Means with dissimilar superscripts within each column under each effect differ significantly

Table 3.Least-squares means for biometrical measurements at 12, 14 and 16 weeks of age (cm)

Source of variation		Mean Squares															
	n	12 Week					n	14 Week					n	16 Week				
		BLN	CG	PG	EL	EW		BLN	CG	PG	EL	EW		BLN	CG	PG	EL	EW
Overall	175	29.3 ± 0.20	22.76± 0.13	24.40± 0.16	10.03± 0.06	5.67± 0.04	159	30.89± 0.15	23.85± 0.08	25.51± 0.10	10.35± 0.04	5.83± 0.02	146	31.73± 0.18	24.63± 0.09	25.98± 0.10	10.51± 0.05	6.02± 0.22
Genetic group																		
Fawn	89	29.87^{a}± 0.25	22.77 ±0.16	24.41± 0.20	10.14^{a}± 0.08	5.68± 0.05	88	31.62^{a}± 0.19	23.69± 0.10	25.54± 0.12	10.51^{a}± 0.05	5.89^{a}± 0.02	76	32.10^{a}± 0.23	24.42^{b}± 0.11	25.79^{b}± 0.12	10.67^{a}± 0.06	6.04± 0.02
Black	86	28.80^{b}± 0.21	22.75 ±0.14	24.39± 0.17	9.93^{b}± 0.07	5.66± 0.04	71	30.17^{b}± 0.22	24.02± 0.12	25.48± 0.14	10.19^{b}± 0.06	5.77^{b}± 0.03	70	31.36^{b}± 0.24	24.85^{a}± 0.12	26.17^{a}± 0.13	10.36^{b}± 0.07	6.01± 0.03
Season of birth																		
Summer	54	29.79± 0.21	22.99± 0.14	24.76± 0.17	10.08± 0.07	5.67± 0.04	49	30.84± 0.26	23.87± 0.14	25.58± 0.16	10.37± 0.07	5.83± 0.03	38	31.53± 0.31	24.70± 0.15	26.17± 0.17	10.50± 0.09	6.04± 0.03
Rainy	8	28.62± 0.55	22.36± 0.36	23.85± 0.44	9.94± 0.18	5.68± 0.11	-	-	-	-	-	-	-	-	-	-	-	-
Winter	113	29.61± 0.14	22.93± 0.09	24.59± 0.11	10.07± 0.04	5.65± 0.03	110	30.95± 0.17	23.84± 0.09	25.43± 0.11	10.33± 0.04	5.83± 0.02	108	31.93± 0.18	24.57± 0.09	25.80± 0.10	10.53± 0.05	6.00± 0.02
Sex of bunny																		
Male	69	29.49 ± 0.23	22.85 ±0.16	24.50± 0.19	10.07± 0.08	5.68 ± 0.05	63	31.08± 0.23	23.84± 0.12	25.57± 0.14	10.34± 0.06	5.84± 0.03	59	31.97± 0.25	24.65± 0.13	25.99± 0.14	10.56± 0.07	6.03± 0.31
Female	106	29.18 ± 0.22	22.67 ±0.15	24.30± 0.18	10.00 ± 0.07	5.66 ± 0.04	96	30.70± 0.19	23.87± 0.10	25.57± 0.12	10.35± 0.05	5.28± 0.02	87	31.50± 0.22	24.62± 0.11	25.97± 0.12	10.47± 0.06	6.02± 0.27

Means with dissimilar superscripts within each column under each effect differ significantly

14 and 16 weeks of age. Mean ear length at 4, 6, 8, 10, 12, 14 and 16 weeks of age for Fawn rabbits were 8.03 ± 0.06, 8.74 ± 0.06, 9.35 ± 0.05, 9.92 ± 0.06, 10.14± 0.08, 10.51 ± 0.05, 10.67 ± 0.06.cm and for BL rabbits it were 7.79 ± 0.06, 8.64 ± 0.05, 9.01 ± 0.05, 9.60 ± 0.05, 9.93 ± 0.07, 10.19 ± 0.06, 10.36 ± 0.07 cm, respectively (Table 1, 2, 3).

Width: Effect of genetic group was significant on ear width at 4 and 14 weeks of age, while the influence of sex of bunny and season of birth were non-significant at all ages studied. The overall least-squares means for ear width at 4, 6, 8, 10, 12, 14,and 16 weeks of age were 4.43 ± 0.03, 4.88 ± 0.02, 5.13 ± 0.02, 5.36 ± 0.03, 5.67 ± 0.04, 5.83 ± 0.02 and 6.02 ± 0.22 cm, respectively. Mean ear width in FN rabbits at 4, 6, 8, 10, 12,14 and 16 weeks of age were 4.55 ± 0.04, 4.87 ± 0.03, 5.13 ± 0.03, 5.36 ± 0.05, 5.68 ± 0.05, 5.89 ± 0.02, 6.04 ± 0.02 and corresponding least-squares means for BL rabbits were 4.32 ± 0.04, 4.90 ± 0.03, 5.14 ± 0.03, 5.37 ± 0.04, 5.66 ± 0.04, 5.77 ± 0.03, and 6.01 ± 0.03 cm, respectively (Table 1, 2, 3).

Discussion

The results of the present study revealed a significant effect of genetic group on most of the biometrical measurements studied at all ages, which agrees well with observations of Gupta *et al*. (2001), Reddy *et al*. (2003) and Chineke *et al*. (2006). FN measured better compared to BL rabbits with respect to body length, chest girth and other biometrical measurements at most of the ages studied. Sex of bunny and season of birth did not exert any influence on most of the biometrical measurements studied; stating the merit of FN over BL rabbits is mostly genetic in nature and less of environment. The findings of the present investigation contradicts the reports of Reddy *et al*. (2003) and Poornima *et al*. (2004) who reported significant effect of season of birth on biometrical traits and of sex on thigh circumference only. The overall least-squares means for biometrical measurements from 4 to 16 weeks of age ranged from 22.03 ± 0.12 to 31.73 ± 0.18 for body length, 16.90 ± 0.08 to 24.63 ± 0.09 for chest girth, 18.04 ± 0.04 to 25.98 ± 0.10 for paunch girth, 7.19 ± 0.04 to 10.519 ± 0.053 for ear length and 4.43 ± 0.03 to 6.02 ± 0.22 cm for ear width. Present findings are in agreement with the findings of Chineke *et al*. (2006) for few of the biometrical traits studied and with findings of Obike *et al.* (2010) for body length at 8 weeks of age.

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