Effect of genetic and non genetic factors on pre-weaning growth of broiler rabbits and their crosses†

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ABSTRACT

The data on 847 bunnies of purebred Flemish Giant (FG) and two synthetic breeds namely APAU Fawn (FN) and APAU Black (BL) and their crosses born during October 2012 to September 2013 were analyzed to study the effect of genetic group, season of birth and litter size at birth on pre-weaning body weights and average daily gain. The genetic group significantly influenced the pre-weaning body weights at all the ages except at 4th week of age whereas the average daily gain was influenced at all the pre-weaning ages. The least squares mean body weights were 50.20 ± 0.48, 111.05 ± 1.26, 154.83 ± 1.97, 203.86 ± 2.90 and 406.81 ± 6.01g at birth, 1, 2, 3 and 4 weeks of age, respectively. The synthetic APAU Black proved its superiority over the other purebreds and crossbreds. The FG, heaviest breed of rabbits, recorded lowest body weights at all the pre-weaning ages while the highest average daily gain showed by it at 4th week of age. Season of birth had a highly significant (P≤0.01) effect on the pre-weaning body weights and average daily gain (ADG). Bunnies born in summer had higher body weights than those born in rainy and winter seasons. As the litter size increased the body weights as well as average daily gain were significantly decreased. In conclusion, based on body weights and average daily gain the synthetic pure breeds APAU Black and APAU Fawn performed well whereas purebred FG was the least performing among all the genetic groups studied.

Key words: Rabbit, cross breeding, growth trait.

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INTRODUCTION

Rabbits have potential as a meat producing animal in developing countries to meet ever increasing demand for animal protein. They have several advantages as meat producing animals as they can thrive on high fiber feed stuffs, can be bred throughout the year and can not compete with humans for the food resources. The meat is rich in protein low in fat and has no religious taboos for its consumption. The pre-weaning growth phase of broiler rabbits has more impact on meat production at finisher stages of production. Growth traits in growing rabbits are important because heavier marketable bodyweight promotes the economics of rabbit production (Rashwan et al., 1997). The pre-weaning body weights are affected by different factors such as breed, season of birth and litter size at birth. Hence the present study was undertaken to study the effects of these factors on pre-weaning body weights of rabbits.

MATERIALS AND METHODS

Data on body weight at birth, at weekly intervals up to 4 weeks of age on - 847 bunnies belonging to Flemish Giant (FG) and synthetic breeds of APAU Fawn (FN) and APAU Black (BL) and their crosses born during the year October 2012 to September 2013 maintained under "Rabbit production for meat" Scheme of the Department of Animal Genetics and Breeding, College of Veterinary Science, Hyderabad were utilized for the present study. Both the synthetic breeds were developed in the University by crossing New Zealand white, Grey Giant and local white Rabbits which are now breeding true to their type. The effect of genetic group, season of birth and litter size at birth on pre-weaning body weights and average daily gain (ADG) were studied. Data were analyzed by least squares technique Harvey (1979) as the frequencies of observations were unequal among the different subgroups.

RESULTS AND DISCUSSION

The least squares means for body weights and average daily gain according to genetic group, season of birth and litter size at birth at different pre-weaning ages were presented in the Table 1.

Effect of Genetic group: The genetic group had significant influence on all the pre-weaning body weights except at 4 weeks of age. The pre-weaning average daily gains were significantly influenced at all the ages studied in the present investigation. The overall least squares mean body weights were 50.20 ± 0.48, 111.05 ± 1.26, 154.83 ± 1.97, 203.86 ± 2.90 and 406.81 ± 6.01g at birth, 1, 2, 3 and 4 weeks of age, respectively. The results of present investigation were in accordance with the findings of Prakash and Gupta (2008) who reported the mean body weights at birth and weaning as 51.6 g and 403.24g, respectively. Kumar et al. 2006) and Sarin (2013) reported higher pre-weaning body weights at birth and weaning than obtained in present investigation, while Obike and Ibe (2010) reported lower pre-weaning body weights at birth and weaning.

Genetic group exerted a significant effect on all pre-weaning ADGs in the present investigation. These findings concur well with the findings of Ozimba and Lukefahr (1991), Gupta et al. (1999) and Sarin (2013). The synthetic APAU Black proved its superiority over the other purebreds and crossbred genotypes. The FG rabbits recorded lowest body weights at all the pre-weaning ages indicating the importance of the APAU black in meat production.

Table 1. Least squares means (g) of pre-weaning body weights

Attributes	n	Birth		1 week		2 weeks		3 weeks		4 weeks	
		Mean	S.E	Mean	S.E	Mean	S.E	Mean	S.E	Mean	S.E
Overall	847	50.20	0.48	111.05	1.26	154.83	1.97	203.86	2.90	406.81	6.01
Genetic groups											
BL × BL	95	51.59^{b}	1.05	118.37^{a}	2.78	171.20^{a}	4.32	217.50^{a}	6.43	417.06	13.35
BL × FN	115	51.30^{b}	0.98	114.68^{ab}	2.40	163.43^{ab}	3.81	213.85^{a}	5.61	423.29	11.50
BL × FG	89	47.92^{d}	1.06	112.73^{abc}	2.80	152.81^{c}	4.57	201.29^{b}	6.76	397.40	13.76
FN × BL	84	52.14^{b}	1.11	107.14^{d}	2.90	155.04^{bc}	4.49	206.10^{b}	6.58	398.91	13.63
FN × FN	75	49.00^{cd}	1.20	116.19^{ab}	3.16	151.32^{c}	4.85	201.65^{b}	7.11	438.38	14.57
FN × FG	111	50.52^{bc}	0.96	109.05^{cd}	2.35	146.22^{c}	3.68	177.37^{d}	5.48	409.32	11.09
FG × BL	81	55.06^{a}	1.12	111.84^{bcd}	2.79	163.86^{de}	4.33	214.26^{a}	6.62	397.85	13.54
FG × FN	35	48.86^{cd}	1.70	112.26^{abc}	4.51	156.22^{bc}	7.08	217.26^{a}	10.38	369.46	21.40
FG × FG	162	45.43^{e}	0.82	97.23^{e}	1.92	133.38^{e}	3.15	185.48^{e}	4.84	409.61	11.07
Season of birth											
Summer	326	49.169^{a}	0.63	115.10^{b}	1.69	156.29^{b}	2.66	206.10^{b}	3.92	435.86^{b}	8.03
Rainy	245	49.669^{a}	0.70	111.11^{a}	1.80	148.33^{a}	2.80	186.38^{a}	4.18	399.25^{a}	8.86
Winter	276	51.768^{b}	0.71	106.96^{a}	1.76	159.88^{b}	2.83	219.11^{c}	4.21	385.32^{a}	8.78
Litter size at birth											
1 – 3	70	52.22^{b}	1.18	116.82^{b}	3.14	161.84^{b}	4.91	219.25^{b}	7.19	473.43^{c}	15.00
4 – 6	390	50.64^{b}	0.52	112.59^{b}	1.28	154.74^{b}	2.04	200.21^{b}	3.06	407.56^{b}	6.34
7 - 9	387	47.74^{a}	0.52	103.77^{a}	1.35	147.91^{a}	2.13	192.13 a	3.17	339.44^{a}	6.55

Table 2. Least squares means (g) of pre-weaning average daily gain

Attributes	n	1 week		2 weeks		3 weeks		4 weeks	
		Mean	S.E	Mean	S.E	Mean	S.E	Mean	S.E
Overall		8.44	0.17	6.11	0.22	7.00	0.28	29.17	0.85
Genetic groups									
BL × BL	95	8.99^{a}	0.38	7.37^{a}	0.49	6.73^{b}	0.61	28.50^{bc}	1.87
BL × FN	115	8.91^{a}	0.33	6.69^{a}	0.43	7.19^{ab}	0.53	29.86^{ab}	1.60
BL × FG	89	8.90^{a}	0.38	5.46^{b}	0.52	6.95^{ab}	0.64	28.02^{bc}	1.92
FN × BL	84	7.60^{bc}	0.40	6.75^{a}	0.51	7.40^{ab}	0.63	28.17^{bc}	1.90
FN × FN	75	9.20^{a}	0.43	4.98^{b}	0.55	7.18^{ab}	0.68	33.40^{a}	2.03
FN × FG	111	8.23^{ab}	0.32	5.30^{b}	0.42	4.35^{c}	0.52	33.37^{a}	1.55
FG × BL	81	8.02^{b}	0.38	7.34^{a}	0.49	7.30^{ab}	0.64	26.03^{c}	1.89
FG × FN	35	8.70^{a}	0.61	6.13^{a}	0.82	8.74^{a}	0.99	24.06^{c}	3.28
FG × FG	162	7.39^{c}	0.26	4.98^{b}	0.36	7.15^{ab}	0.46	31.08^{ab}	1.54
Season of birth									
Summer	326	9.20^{c}	0.23	5.85^{b}	0.30	7.24^{b}	0.37	32.91^{c}	1.12
Rainy	245	8.46^{b}	0.24	5.29^{b}	0.32	5.42^{a}	0.40	30.03^{b}	1.24
Winter	276	7.65^{a}	0.24	7.21^{a}	0.32	8.34^{c}	0.40	24.56^{a}	1.26
Litter size at birth									
1 – 3	70	8.94^{b}	0.43	6.16	0.56	8.25^{b}	0.68	36.32^{c}	2.10
4 – 6	390	8.62^{ab}	0.17	6.06	0.23	6.52^{ab}	0.29	29.53^{b}	0.89
7 - 9	387	7.75^{a}	0.18	6.12	0.24	6.23^{a}	0.30	21.65^{a}	0.95

The FN x FN recorded highest ADG (33.40g) while FG x FN (24.06g) recorded lowest ADG at weaning. The results of present investigation were in accordance with the findings of Sarin (2013) who reported the mean ADGs from birth to one week and weaning as 8.66 and 29.52g, respectively. Lower values are reported by Reddy et al. (2001), Devi et al. (2007) and Sivakumar et al. (2013).

Effect of Season of birth: Season of birth had a highly significant (P≤0.01) effect on the pre-weaning body weights and ADGs, which is in agreement with the reports of Gupta et al. (1999) and Sarin (2013). In contrary Devi et al. (2007) reported non-significant effect. Summer born rabbits recorded significantly higher body weights and average daily gain at most of the pre-weaning ages. Gupta et al (1999) and Prakash and Gupta (2008) also found that bunnies born in summer had higher body weights than those born in rainy and winter seasons. The difference associated with the season of kindling can be attributed to the prevalent environmental conditions and to stress factors affecting feed intake (Eberhart, 1980).

Effect of litter size at birth: Bunnies born in small litters recorded significantly (P≤0.01) higher pre-weaning body weights and average daily gain. As the litter size increased, the body weights as well as average daily gain were decreased. Similar results were also reported by Gupta et al. (1999), Reddy et al. (2001) and Sarin (2013).

In conclusion, based on body weights and average daily gain the genetic groups ranked in descending order as follows: BL X BL, BL X FN, FN X FN, FG X BL, FN X BL, FG X FN, FN X FG, BL X FG, and FG X FG. The synthetic pure breeds APAU Black and APAU Fawn performed well whereas purebred FG was the least performing among all the genetic groups studied.

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