



ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(11): 2406-2410
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www.thepharmajournal.com

Received: 11-08-2023

Accepted: 13-09-2023

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Effect of season and sex on pre and post weaning performance in two rabbit genetic groups

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Abstract

The present study was carried on data obtained from 49 litters of two rabbit genetic groups namely APAU-Fawn (FN) and APAU-Black (BL) reared at Rabbit Research Centre, Hyderabad. The objective of the research was to assess the impact of season and sex on pre and post weaning body weight gain among rabbits under study. The mean litter size at birth was 5.57 ± 0.33 and 5.24 ± 0.44 in FN and BL rabbits, respectively, whereas the litter size at weaning 3.96 ± 0.23 and 3.57 ± 0.31 for the same. Sex of the rabbit did not have any significant effect on pre-weaning body weights in FN rabbits, whereas female weighed significantly heavier than male at 4 weeks of age in BL rabbits. Winter season proved to be congenial for growth as evident in post weaning body weights among both FN and BL rabbits and differed significantly over the body weights measured in summer and rainy season. Significant differences in litter weights were observed among FN rabbits, with winter being more favourable followed by rainy season.

Keywords: Body weights, season, litter size

Introduction

The increasing human population around the world has necessitated the need to search option for alternative source of animal protein for human consumption (Isaac *et al.* 2022) [6]. This increase in demand for animal protein could supplemented through commercial rabbit rearing, as they are known for their higher prolificacy, shorter gestation period, low cholesterol level and lesser space requirement compared to other farm animals (Gono *et al.*, 2013) [5]. Commercial rearing of rabbits and its profitability is largely dependent on the litter size at birth, growth and survivability of the kits during the weaning period (Odeyinka *et al.*, 2008) [8]. The growth registered by kits during pre-weaning period has a critical impact on its body weight gain during post weaning period, with respect to rabbits reared for meat production (Gerencser *et al.* 2011) [4]. As evident from many studies, it is established that the environmental factors play a major role in determining the growth rate and survivability of rabbits during pre and post weaning period. In this context the present study was carried out to understand the impact of season and sex on growth performance of two genetic group of rabbits, which were evolved from crossing New Zealand White and Grey Giant rabbits in F₂ and further generations.

Material and Methods

The present study was carried out at Rabbit Research Centre, Department of Animal Genetics & Breeding, College of Veterinary Science, Hyderabad, Telangana State. Two rabbit genetic groups developed at the same facility, namely APAU-Fawn and APAU-Black were reared under uniform environment conditions. The rabbits were offered about 100 g of concentrate feed composed of 50% maize, 26% Ground Nut Cake, 22% Wheat Bran, 2% Mineral Mixture and Alfa alfa green fodder daily. Water was provided ad libitum through nipple system. The data generated for the period between 2019-2021 from 49 litters pertaining to the rabbit breeds under study were utilised for analysis and further interpretation.

Statistical Analysis

Body weights were recorded at weekly intervals from 0 day to 4 weeks and at bi-weekly intervals from 6 to 16 weeks. For, the purpose of analysing the impact of season on body weight gain, the months of March, April, May and June were categorised as summer (A), while the months of July, August, September and October as rainy (B) and November, December, January and February as winter (C) seasons. The data thus generated were subjected to statistical analyses using SPSS version 16.

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Results

Pre-Weaning Body Weight

The results obtained post analysis of the data generated is presented in Table 1&2. The overall mean body weight in FN rabbits ranged from 47.13±0.90 g, at birth to 381.99±7.75g at 4 weeks of weaning age, while the same in BL rabbits ranged from 48.56±1.23 g, at birth to 400.19±14.28 g at 4 weeks, respectively. O.M. Akinsola *et al.*, (2014) [1], Desouky *et al.*, (2021) [3], reported a higher body weight at birth and at 4 weeks of age. Males recorded higher body weights compared

to females in FN rabbits, though not significantly. Whereas, female recorded significantly higher body weight, compared to males at 4 weeks of age among BL rabbits. Season exerted reasonable effect on the pre weaning body weights in FN and BL rabbits. Winter recorded significantly higher body weights compared to those recorded in rainy and summer season in FN & BL rabbits. Body weights recorded at 2 and 3 weeks of age showed significantly higher values in FN rabbits while in BL rabbits the same were observed at birth, 3 and 4 weeks of age.

Table 1: Pre-weaning body weights of APAU-FN genetic group

	n	BW 0	BW 1	BW 2	BW 3	BW 4
Overall	110	47.13±0.90	112.20±1.94	177.10±4.23	244.41±5.74	381.99±7.75
Gender						
M	30	50.90±1.66	112.03±3.74	181.70±9.47	250.80±10.71	374.17±13.55
F	80	45.71±1.02	112.26±2.27	175.38±4.59	242.01±6.77	384.93±9.34
Season						
A	40	47.30±1.46	106.93±3.16	166.08±7.78	239.98±8.87 ^b	399.33±12.70
B	35	44.89±1.57	112.40±3.20	169.17±5.89	219.17±8.97	358.54±14.26
C	35	49.17±1.56	118.03±3.46	197.63±6.73 ^a	274.71±9.83 ^a	385.63±12.36

Table 2: Pre-weaning body weights of APAU-BL genetic group

	n	BW 0	BW 1	BW 2	BW 3	BW 4
Overall	77	48.56±1.23	125.17±2.74	208.78±8.21	283.97±10.46	400.19±14.28
Gender						
M	36	49.78±1.96	121.25±4.01	212.08±12.38	267.42±14.30	372.11±19.52
F	41	47.49±1.52	128.61±3.66	205.88±10.91	298.51±14.73	424.85±19.83 ^a
Season						
A	28	45.57±2.19	122.04±4.72	200.54±12.10	281.46±15.37 ^a	394.93±18.76 ^b
B	22	46.14±1.68	124.68±5.66	192.95±13.10	240.05±9.20	321.41±18.97
C	27	53.63±1.95 ^a	128.81±3.85	230.22±15.80	322.37±21.58 ^b	469.85±25.92 ^a

Mean with superscripts differ significantly ** ($p \leq 0.01$)

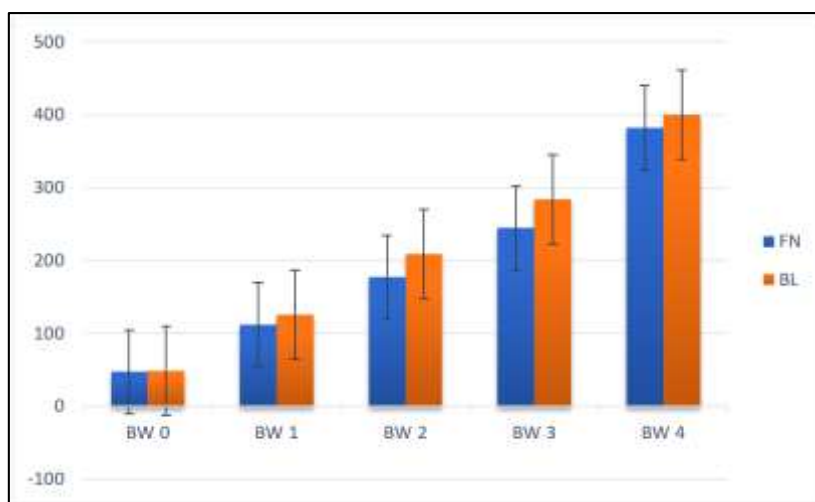


Fig 1: Graph depicting pre-weaning body weights in FN & BL rabbits.

Post-Weaning Body Weights

The results generated from the analysis of post-weaning body weights is presented in Table 3 & 4. The overall mean body weights post weaning, ranged from 671.48±18.82 g at 6 weeks to 1841.15±33.70 at 16 weeks of age among FN rabbits, while in BL the same ranged from 642.39±20.05 at 6 weeks to 1906.88±54.10 at 16 weeks of age. The findings of the present study with respect to body weights at 12 and 14 weeks were higher than the observations of Sameul *et al.*, (2015) [10], whereas Desouky *et al.*, (2021) [3] reported higher body weights at 8 and 12 weeks of age.

The effect of sex was non-significant on post-weaning body weights among FN rabbits, though male recorded higher body weights compared to female. A similar observation was recorded with respect post weaning body weights in BL rabbits, with males recording higher body weights compared to females, to a greater extent among the body weights recorded at bi-weekly intervals. Among male, body weights at 6 and 16 weeks of age were 697.45±43.94g and 1873.26±67.96 g, respectively in FN rabbits, while in BL rabbits the same were 645.09±30.30 g and 1903.42±62.87 g, respectively. While in females the body weights ranged from

661.54±19.75 g at 6 weeks of age to 1829.24±38.61 g at 16 weeks of age, in FN rabbits and from 639.97±26.59 g at 6 weeks of age to 1910.63±89.80 g at 16 weeks of age among BL rabbits.

Season played a significant role in influencing the body weight gain among FN and BL rabbits. Winter season proved to be more congenial for rabbits to grow, as was evident from the body weights recorded at bi-weekly interval in post-weaning age. Among FN rabbits, winter season had highly significant influence on body weights measured compared to rainy and summer season at all ages of post-weaning. A similar trend was observed among BL rabbits at all ages of

post weaning body weights recorded. Findings, of the present study were in accordance with reports of Desouky *et al.*, (2021) [3]. Among FN rabbits in summer season body weights ranged from 650.30±20.37 g at 6 weeks to 1907.86±45.70 g, in rainy from 565.37±21.03 g to 1624.44±51.10 g and in winter from 794.76±40.65 g to 1973.93±55.20 g, respectively. Whereas, in BL rabbits the body weights in summer ranged from 610.04±23.98 g at 6 weeks of age to 1847.95±56.02 g at 16 weeks of age, in rainy from 502.35±32.07 g to 1602.92±76.46 g and in winter 778.48±24.83 g to 2215.88 g, respectively.

Table 3: Post-weaning body weights of APAU-FN genetic group

	BW 6	BW 8	BW 10	BW 12	BW 14	BW 16
Overall	671.48±18.82 (110)	884.88±20.17 (109)	1107.14±21.33 (106)	1323.47±23.68 (101)	1539.92±27.11 (97)	1841.15±33.70 (85)
Gender						
M	697.45±43.94 (30)	884.42±46.27 (29)	1132.93±46.59 (28)	1337.18±49.00 (28)	1572.72±58.01 (25)	1873.26±67.96 (23)
F	661.54±19.75 (80)	885.06±21.54 (80)	1097.88±23.59 (78)	1318.21±26.81 (73)	1528.53±30.36 (72)	1829.24±38.61 (62)
Season						
A	650.30±20.37 ^b (40)	886.20±23.93 ^b (40)	1109.69±28.18 ^b (37)	1323.36±32.29 ^b (36)	1560.79±43.20 ^b (33)	1907.86±45.70 ^b (28)
B	565.37±21.03 (35)	753.37±28.67 (34)	974.85±28.15 (34)	1187.30±32.57 (30)	1392.57±37.92 (30)	1624.44±51.10 (27)
C	794.76±40.65 ^a (35)	1007.86±38.37 ^a (35)	1229.53±39.60 ^a (35)	1440.29±44.08 ^a (35)	1649.68±46.65 ^a (34)	1973.93±55.20 ^a (30)

Mean with superscripts differ significantly ** ($p \leq 0.01$)

Table 4: Post-weaning body weights of APAU-BL genetic group

	BW 6	BW 8	BW 10	BW 12	BW 14	BW 16
Overall	642.39±20.05 (74)	889.09±24.10 (74)	1135.36±30.22 (73)	1365.43±34.89 (67)	1601.59±45.51 (61)	1906.88±54.10 (50)
Gender						
M	645.09±30.30 (35)	892.40±38.16 (35)	1142.06±45.79 (34)	1387.00±51.94 (32)	1581.30±64.02 (30)	1903.42±62.87 (26)
F	639.97±26.59 (39)	886.13±30.30 (39)	1129.51±40.06 (39)	1345.71±46.71 (35)	1621.23±64.47 (31)	1910.63±89.80 (24)
Season						
A	610.04±23.98 ^b (27)	870.93±28.25 ^b (27)	1109.92±37.41 ^b (26)	1347.81±46.42 ^b (26)	1565.40±48.79 ^b (25)	1847.95±56.02 ^b (22)
B	502.35±32.07 (20)	707.35±37.04 (20)	934.00±45.85 (20)	1165.00±51.90 (17)	1361.25±58.13 (16)	1602.92±76.46 (12)
C	778.48±24.83 ^a (27)	1041.89±32.09 ^a (27)	1309.00±44.41 ^a (27)	1526.50±57.68 ^a (24)	1839.10±90.41 ^a (20)	2215.88±93.64 ^a (16)

Mean with superscripts differ significantly ** ($p \geq 0.01$)

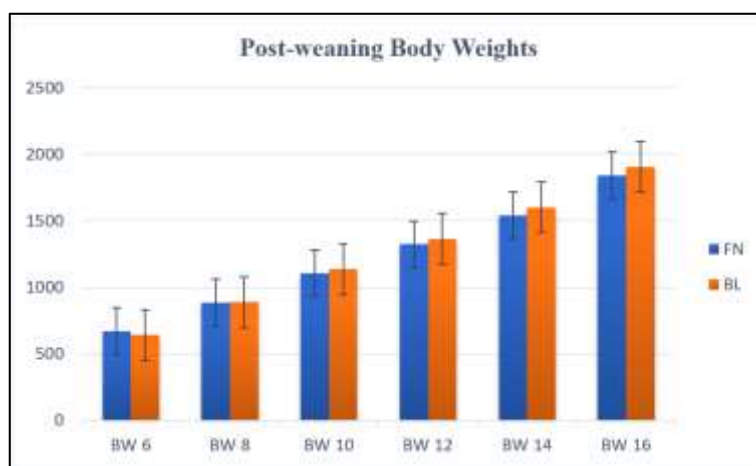


Fig 2: Graph depicting post-weaning body weights in FN & BL rabbits

Litter Traits

The results obtained post analysis of data generated for litter traits are mentioned in Table 5, 6, 7 & 8. The overall litter weights at birth ranged from 185.14±11.16 g at birth to 1500.68±89.95 g at 4 weeks among FN rabbits, while the same for BL rabbits ranged from 178.05±16.53 g at birth to 1467.38±145.11 g at 4 weeks, respectively. The observed litter weights at birth in the present study was lesser compared to the findings of Akinsola *et al.*, (2014) [1], Sameul *et al.*,

(2015) [10], Bhatt *et al.*, (2020) [2], Olateju and Chineke, (2022) [9]. The effect of season was quite evident with respect to its influence on litter weight at all ages of weights recorded. Among FN rabbits, the litter weights recorded in winter were highly significant, compared to those recorded at rainy and summer season. Significant effect of season on litter weights were also reported by Tume, *et al.*, (2010) [11]. Whereas, among BL rabbits no significant differences were observed among litter weights recorded at all ages during three seasons.

The overall mean litter size at birth and weaning were 5.57 ± 0.33 and 3.96 ± 0.23 , respectively among FN rabbits and the same in BL rabbits were 5.24 ± 0.44 and 3.57 ± 0.31 , respectively. The litter size at birth was in accordance with observations of Sameul, *et al.*, (2015) [10], whereas litters size at weaning lesser than what was reported in the same study. Similarly, Akinsola *et al.*, (2014) [1], Bhatt *et al.*, (2020) [2],

Desouky *et al.*, (2021) [3] reported higher litter size at birth and weaning. Season had no significant influence on litter size at birth and weaning among both FN & BL rabbits. While the reports of Tume, *et al.*, (2010) [11], Desouky *et al.*, (2021) [3] reported significant influence of season litter size at birth weaning.

Table 5: Litter weights of APAU-FN genetic group

	n	LW 0	LW 1	LW 2	LW 3	LW 4
Overall	28	185.14±11.16	440.79±29.32	695.75±49.09	960.18±64.02	1500.68±89.95
Season						
A	12	157.67±10.41	356.42±25.74	553.58±42.05	799.92±53.56	1331.08±103.43
B	8	196.38±25.49 ^b	491.75±63.50 ^b	740.13±101.47 ^b	958.88±136.96 ^b	1568.63±202.24 ^b
C	8	215.13±19.01 ^a	516.38±51.31 ^a	864.63±87.46 ^a	1201.88±113.44 ^a	1687.13±154.36 ^a

Mean with superscripts differ significantly ** ($p \geq 0.01$)

Table 6: Litter weights of APAU-BL genetic group

	n	LW 0	LW 1	LW 2	LW 3	LW 4
Overall	21	178.05±16.53	458.95±46.52	765.52±81.71	1041.24±113.51	1467.38±145.11
Season						
A	7	182.29±22.35	488.14±97.59	802.14±191.07	1125.86±264.59	1579.71±328.67
B	5	203.00±40.33	548.60±82.54	849.00±121.60	1056.20±170.84	1414.20±229.24
C	9	160.89±24.70	386.44±52.60	690.67±92.37	967.11±132.45	1409.56±177.30

Table 7: Litter size at birth & weaning APAU-FN genetic group

	n	LSB	LSW
Overall	28	5.57±0.33	3.96±0.23
Season			
A	12	4.83±0.41	3.42±0.25
B	8	6.63±0.64	4.38±0.47
C	8	5.63±0.56	4.38±0.43

Table 8: Litter size at birth & weaning among APAU-BL genetic group

	n	LSB	LSW
Overall	21	5.24±0.44	3.57±0.31
Season			
A	7	5.57±1.07	3.86±0.65
B	5	6.00±0.63	4.20±0.52
C	9	4.56±0.36	3.00±0.35

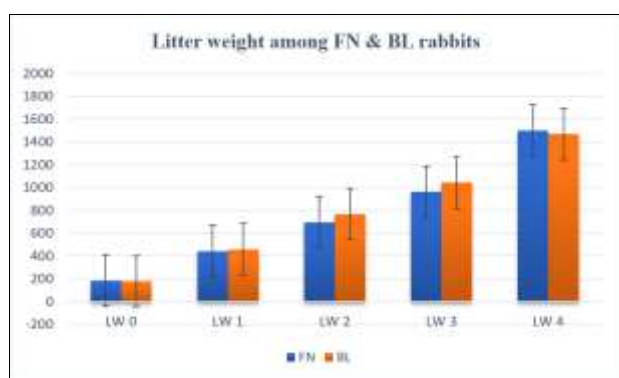


Fig 3: Graph depicting litter weights in FN & BL rabbits

Conclusion

The effect of season on the performance of rabbits has been documented from research carried out throughout the world. More specifically, the impact of season on the growth and survivability of bunnies prior to weaning could play a major role in determining the profitability of rabbit rearing. Proper care and management of bunnies before weaning and providing optimum environmental conditions during their

growth is recommended for a sustainable farming.

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