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Pre and post weaning performance of broiler rabbits

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Abstract
Selective breeding of rabbits for body weights and litter size at birth is practised to improve the production. Data on 899 bunnies belonging to New Zealand White (NZW), Flemish Giant (FG), Soviet Chinchilla (SC), Grey Giant (GG), Californian White (CW), APAU Black (BL) and Fawn (FN) were analyzed to assess the influence of genetic groups on pre weaning and post weaning body weights and litter traits. The overall least square mean body weights at birth, 1, 2, 3 and 4 weeks of age were 49.776±0.917, 114.82±2.691, 163.293±3.999, 229.504±7.470, 338.944±12.955, respectively and at 6, 8, 10, 12, 14 and 16 weeks of age were 691.060±20.676, 935.953±24.863, 1164.426±27.859, 1369.319±32.464, 1567.659±39.089 and 1841.987±51.090 g respectively. There was a significant effect of genetic groups on body weights at different pre weaning and post weaning ages and on litter traits of rabbits.

Keywords: rabbits, genetic groups, pre weaning, post weaning, litter traits

1. Introduction
Rabbits are considered to have major contribution in the supply of animal protein factor to the mankind. Their commercial production is encouraged owing to their high prolificacy, early maturity, rapid growth rate, high genetic potential for selection, limited competition with humans for similar foods and high-quality nutritious meat [1]. Rabbits are medium size hopping animals with long legs, long ears, a short tail and they require small compartments unlike cattle and other small ruminants which require a large area of land [2]. They are noiseless and easy to manage. Rabbits utilise unusable vegetation material, residue from crop production, organic wastes from the food industry and domestic waste, converting these into rich high protein nutrition for human consumption [2]. Rabbits are largely kept by limited-resourced farmers who maintain small scale operations with the aim of producing meat and income. Rabbit meat is almost cholesterol free and is therefore most favourable for heart patients [3]. The sodium, calcium and phosphorous contents of rabbit meat are comparatively less than other meats [4]. The ratio of meat to bone ratio is high meaning there is more edible meat on the carcass than even a chicken. Rabbits contain selenium that works as an anti-oxidant to remove free radicals before they can do harm to the human body. Some types of cancer, as well as ravages of aging people can be battled with selenium which is contained in rabbits [5]. On average, rabbit meat contains calcium (21.4 mg/100 g), phosphorus (347 mg/100 g), fat (9.2 g/100 g) and cholesterol (56.4 mg/100 g) [6]. For the overall improvement of the rabbit production and a profitable enterprise, the performance levels at the pre-weaning and post weaning ages need to be established for the various genetic groups under the local climatic conditions. The pre weaning and post weaning growth of few exotic breeds of rabbit under Indian condition is studied in the present investigation.

2. Material and Methods
Data on 45 New Zealand White (NZW), 3 Grey Giant (GG), 25 Soviet Chinchilla (SC), 28 Flemish Giant (FG), 18 Californian White (CW), 24 APAU Fawn (FN) and 13 APAU Black (BL) rabbits litters obtained during 2017-18 in the "Rabbit Production for Meat" scheme of the Department of Animal Genetics and Breeding, College of Veterinary Science, Hyderabad were utilized for the present study. APAU black is a synthetic breed developed by crossing NZW, GG and local white rabbits up to F3 and F4 generations. All the does were reared under standard and uniform management in galvanized iron cages. Data on body weights from birth to weaning age of four weeks at weekly intervals and at 6, 8, 10, 12, 14 and 16 weeks of post weaning ages were recorded and were subjected to least squares analysis [7] to study the influence of genetic groups on the performance evaluation of body weight traits and litter traits of rabbits.

3. Results and Discussion

There was a significant effect of genetic groups on all the pre-weaning and post weaning body weights and litter traits studied. The overall least-squares mean body weights at birth, 1, 2, 3 and 4 weeks of age were 49.776±0.917, 114.82±2.691, 163.293±3.999, 229.504±7.470, 388.944±12.955, respectively (Table 1). The overall least-squares mean body weights at 6, 8, 10, 12, 14 and 16 weeks of age were 691.060±20.676, 935.953±24.863, 1164.426±27.859, 1369.319±32.464, 1567.659±39.089 and 1841.987±51.090 g respectively (Table 2). The means of weight in seven genetic groups ranged from 47.151±0.531g (NZW) to 52.611±0.699g (FG), 108.8±2.134g (FN) to 119.948±3.005g (BL), 156.339±3.197g (SC) to 174.333±7.868g (GG), 203.5±6.014g (SC) to 259.167±14.595g (GG), 361.091±12.159g (CW) to 429.5±28.514g (GG) at birth, 1, 2, 3 and 4 weeks of age, respectively while the weights at 6, 8, 10, 12, 14 and 16 weeks of age ranged from 630.942±11.913g (NZW) to 825.083±45.232g (GG), 840.098±19.532g (SC) to 1127.083±54.080g (GG), 1055.841±21.578g (SC) to 1370±61.032g (GG), 1227.581±26.034g (SC) to 1575±67.525g (GG), 1393.698±30.671g (SC) to 1746.286±92.014g (GG) and 1701.768±39.954g (FN) to 2005.333±122.063g (GG), respectively. The GG (6.6±0.308) had higher litter size and CW (5.635±0.157) had the lower litter size at birth, while FN (4.708±0.152) had the higher and GG (3.040±0.346) had the lower litter size at weaning. FN (260.154±23.29g) had the lowest and GG (419.667±48.483g) had the highest litter weight at birth, where as BL (1783.923±202.09g) had the highest and SC (1390.56±145.735g) had the lowest litter weight at weaning (Table 3).

Table 1: Pre weaning mean body weights (g) of rabbits

Genetic group	At Birth			At 1st week			At 2nd week			At 3rd week			At 4th week		
	n	Mean	SE	n	Mean	SE	n	Mean	SE	n	Mean	SE	n	Mean	SE
NZW	272	47.151^{c}	0.531	214	110.435^{bc}	1.565	196	156.485^{c}	2.384	191	216.230^{cd}	4.480	175	388.440^{ab}	7.467
FG	157	52.611^{a}	0.699	134	115.649^{abc}	1.977	130	166.715^{abc}	2.928	126	238.032^{abc}	5.516	118	385.839^{ab}	9.093
SC	151	49.219^{bc}	0.712	121	111.884^{abc}	2.081	109	156.339^{c}	3.197	106	203.500^{d}	6.014	95	365.937^{b}	10.134
GG	25	50.360^{ab}	1.751	18	118.778^{ab}	5.395	18	174.333^{a}	7.868	18	259.167^{a}	14.595	12	429.500^{a}	28.514
CW	96	50.583^{ab}	0.894	73	118.247^{ab}	2.679	70	157.743^{c}	3.990	68	245.000^{ab}	7.509	66	361.091^{b}	12.159
BL	68	50.500^{ab}	1.062	58	119.948^{a}	3.005	56	171.357^{ab}	4.461	56	224.054^{bcd}	8.275	54	429.463^{a}	13.442
FN	130	48.008^{bc}	0.768	115	108.800^{c}	2.134	111	160.081^{bc}	3.168	110	220.545^{bcd}	5.904	100	362.340^{b}	9.878
Overall	899	49.776	0.917	733	114.82	2.691	690	163.293	3.999	675	229.504	7.470	620	388.944	12.955

Means with same superscript(s) do not differ significantly ($P \leq 0.05$)

Table 2: Post weaning mean body weights (g) of rabbits

Genetic group	At 6th week			At 8th week			At 10th week			At 12th week			At 14th week			At 16th week		
	n	Mean	SE	n	Mean	SE	n	Mean	SE	n	Mean	SE	n	Mean	SE	n	Mean	SE
NZW	173	630.942^{c}	11.913	169	875.473^{cd}	14.411	165	1,112.558^{cd}	15.758	131	1,273.847^{c}	19.567	124	1,496.452^{b}	21.862	116	1,758.793^{c}	27.761
FG	115	694.296^{ab}	14.611	115	933.896^{c}	17.470	111	1,177.730^{bc}	19.213	95	1,425.947^{b}	22.977	86	1,682.907^{a}	26.251	80	1,962.700^{ab}	33.428
SC	94	638.426^{c}	16.161	92	840.098^{d}	19.532	88	1,055.841^{d}	21.578	74	1,227.581^{c}	26.034	63	1,393.698^{b}	30.671	62	1,703.113^{c}	37.972
GG	12	825.083^{a}	45.232	12	1,127.083^{a}	54.080	11	1,370^{a}	61.032	11	1,575^{a}	67.525	7	1,746.286^{a}	92.014	6	2,005.333^{a}	122.063
CW	63	669.825^{c}	19.741	62	877.613^{cd}	23.792	60	1,092.133^{cd}	26.132	55	1,290.000^{c}	30.198	54	1,495.222^{b}	33.129	51	1,805.235^{bc}	41.867
BL	54	741.426^{b}	21.323	53	1,018.868^{b}	25.733	46	1,229.696^{b}	29.845	42	1,477.262^{ab}	34.557	38	1,676.684^{a}	39.492	30	1,956.967^{ab}	54.588
FN	99	637.424^{c}	15.748	97	878.639^{cd}	19.021	89	1,113.022^{cd}	21.456	72	1,315.597^{c}	26.393	65	1,482.369^{b}	30.196	56	1,701.768^{c}	39.954
Overall	610	691.060	20.676	600	935.953	24.863	570	1164.426	27.859	480	1369.319	32.464	437	1567.659	39.089	401	1841.987	51.090

Means with same superscript(s) do not differ significantly ($P \leq 0.05$)

Table 3: Litter traits of rabbits

Genetic group	Litter size at birth		Litter size at weaning		Litter weight at birth		Litter weight at weaning	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
NZW	6.316^{ab}	0.093	4.040^{bc}	0.105	278.804^{b}	12.381	1,477.761^{a}	107.437
FG	5.994^{bc}	0.123	4.274^{ab}	0.138	295.000^{b}	15.870	1,626.036^{a}	137.706
SC	6.454^{ab}	0.125	3.763^{bc}	0.140	297.280^{b}	16.795	1,390.560^{a}	145.735
GG	6.600^{a}	0.308	3.040^{d}	0.346	419.667^{a}	48.483	1,718.000^{a}	420.700
CW	5.635^{c}	0.157	3.667^{c}	0.176	285.647^{b}	20.367	1,401.882^{a}	176.729
BL	5.926^{bc}	0.186	4.618^{a}	0.210	264.154^{b}	23.290	1,783.923^{a}	202.098
FN	6.092^{abc}	0.135	4.708^{a}	0.152	260.042^{b}	17.141	1,509.750^{a}	148.740

Means with same superscript(s) do not differ significantly ($P \leq 0.05$)

The results obtained were in accordance with the published literature which revealed more or less similar body weights at birth and first week of age in different genetic groups and the body weights observed at birth, 1, 2, 3 and 4 weeks of age were in accordance with the published literature ranging from 47.77 to 66.5, 88.84 to 106.2, 142.86 to 175.35, 209.54 to 296.31 and 294.88 to 527.92 g respectively [8, 9, 10]. GG rabbits had the highest body weight at post weaning ages and a similar result was recorded in a study on effect of genetic factors on post weaning body weights of rabbits [11]. The significant effect of genetic groups on post weaning body weights at different ages and fawn having the lowest litter weight at birth were in accordance with literature studied on post weaning performance in rabbits [12]. The litter weights at birth and weaning and body weights at different pre and post weaning ages are higher in FG when compared to NZW which are similar to previous findings in a study on performance of rabbits [13].

4. Conclusion

Grey Giant rabbits recorded significantly higher body weights at different pre and post weaning ages while bunnies of Soviet Chinchilla breeds recorded significantly lower body weights at post weaning ages. To conclude, the pre-weaning and post weaning growth traits and litter traits are significantly influenced by the genetic group. Hence, selection of appropriate genetic group would go a long way in a more profitable enterprise. Higher litter size, litter weight and weaning body weights were observed in Grey Giant indicating its better feed efficiency and recommended for crossing to improve the body weights of other breeds.

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