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EFFECT OF LITTER SIZE AND STOCKING DENSITY ON BODY WEIGHTS OF PRE AND POST-WEANED NEW ZEALAND WHITE RABBITS

By

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SUMMARY

Data on 41 does and 807 weaned rabbits were used to study the effect of litter size and stocking density on body weights at different age phases in New Zealand white rabbits. It was found that litter size and stocking density had high significant effect on body weights. The major effect of litter size was on the 21st day body weights as 40% of the variation were contributed by litter size. meanwhile, at 28 day of age only 18%. After weaning litter size had significant but poor effect on body weights. stocking density of 4 kits/cage had better body weights than 7 kits/cage.

INTRODUCTION

Rabbit production efficiency, and product volume and quality can be greatly increased by increasing viable litter sizes via selecting breeds of an excellent mothering ability followed by efficient and proper management.

Pre and post-weaning growth performance of broiler rabbits determine the profitability of the rabbitry. One major factor affecting the growth of kits is the litter size among which the broiler rabbits grow. Number of brothers and sisters born together affect the subsequent body weights at different phases of age. Babile (1984) found significant differences in the performance of rabbits derived from different litter sizes.

Investigations on stocking density wit rabbits revealed inconsistent trends, possibly because of the diversity of breeds, group size and management practices used (Gippert, 1984; Ferreira, 1984 and Maertens and De Groote, 1984).

The objective of this study was to investigate the influence of litter size and stocking density on the performance of broiler rabits.

MATERIAL AND METHODS

Breeding Flock Management:

A random mating breeding flock of New Zealand White rabbits at Animal Husbandry Dept., Faculty of Vet. Medicine, Alex. University. Was the source of the rabbits used in this study. Data were recorded on 41 does and 807 weaned bunnies. They were housed in breeder and progeny metal cages and located in a well ventilated open sided house.

Rabbits were properly fed on a commercial pelted rations containing 16% crude protein and 60% TDN for the parents and 18% crude protein and 70% TDN for the weaned rabbits. Freash water was available all the time from the drinking valves.

Matinig Mangement and Pregnancy diagnosis:

One buck to 10 does was available, with 4 to 5 matings per week for the buck. Does were moved to the buck hutch and allowing them together until mating is accomplished.
Abdominal palpation was carried out 12 days after successful mating to diagnose the pregnancy.

After kindling, the number of kits born were counted according to the does, and 21 days later

average litter weights were recorded, and weaning was done at 28 days of age. Weanling kits were ear-tagged according to their does and their individual weights were recorded.

Stocking Density:

At 28 days of age, weanling kits were randomly assigned (within litter) to one of the two stocking density, 4 and 7 rabbits and placed in a separate cages of the same dimensions (75 x 75 x 45 Cm) and properly supplied with feed and water. Body weights were recorded at 42, 56 and 70 days of age.

Statistical analysis:

Data were analyzed to clear up the effect of litter size and stocking density on body weights using GLM (SAS 1985) to fulfill the following equation:

$$Y_{ijk} = U + L_i + S_j + e_{ijk}$$

Where:

Y_{ijk} = The observed value of the traits studied,
U = Overal 1 mean,
L_i = Fixed effect of ith litter size (i=1,2,...111)
S_j = Fixed effect of the jth stocking density (j=4 and 7),
e_{iijk} = Random error.

Also, regression analysis was done to see how body weights affected by litter size and how much the contribution to variations in body weights by litter size by estimating R^2 % (coefficient of determination).

RESULTS AND DISCUSSION

Data of the least squares analyses of variance concerning the effect of litter size, stocking density on body weights at different phases of age of New Zealand white rabbits are presented in Table 1.

It was found that, litter size (ranged from 1 to 11) had highly significantly effect. ($P < 0.01$) on pre-weaning, weaning and post-weaning weights of rabbits. Meanwhile, body weights at 42, 56 and 70 days of age are affected significantly ($P < 0.01$) by stocking density.

Table 2 and figure 1 explain the significant effect of the litter size on body weights. Pre-weaning body weight (at 21 days of age) declined highly significantly ($P < 0.01$) with the increment

Table (1): Least squares analysis of variance for the effect of litter size at kindling and stocking density on body weights at different stages of New Zealand White rabbit growth.

S.O.V.	D.F.	Mean Squares				
		21-day wt. (pre-weaning)	28-day wt. (weaning)	24-day wt.	56-day wt. (pre-weaning)	70-day wt.
Litter size	9	12827393.4**	50244.11**	784737.47**	847370.58**	1161049.00**
Stocking density	1	-----	-----	2058265.86**	954640.95**	533890.44**
Error	796	181107.1	16235.56	36390.57	57915.10	67474.44

** P < 0.01 (highly significant).

Table (2) : Means and their standard errors of body weights at preweaning (21-day), weaning (28-day) and post weaning (42, 56 and 78 days in New Zealand White rabbits of different litter sizes and different stocing density.

S.O.V.	Frequency		Preweaning 21-day litter wt.	Weaning 28-day wt.	24-day wt.	Post weaning 56-day wt.	78-day wt.
Litter size			A	BC	AB	A	A
	1	3	572.88±52.54	717.33±98.78	1259.67±49.58	1882.00±115.60	2356.33±163.63
			A	A	A	A	A
	3	6	56.11±21.68	855.67±34.92	1351.22±48.24	1896.17±57.63	2372.67±68.69
			C	B	A	A	ABC
	4	4	437.56±26.73	752.37±57.38	1311.58±65.14	1838.20±67.54	2225.88±70.22
			BC	BC	AB	AB	AB
	5	11	483.88±8.44	699.14±17.51	1251.17±23.54	1768.21±34.00	2239.44±37.06
			C	CD	BC	BC	AB
	6	19	431.95±5.88	662.97±14.67	1168.17±20.96	1641.87±22.31	2070.28±29.99
			D	E	CED	CD	D
	7	22	345.95±4.79	567.58±12.48	1057.01±18.04	1549.52±21.92	1908.50±23.33
			ED	ED	CD	BC	BCD
	8	23	336.14±5.87	589.47±10.97	1112.16±15.99	1639.00±19.02	2055.20±29.60
			EF	E	E	D	D
	9	13	386.82±5.62	505.16±9.49	959.76±17.70	1454.85±25.67	1884.76±18.85
			F	E	DE	CD	D
	10	5	294.99±48.18	532.58±7.89	1015.45±11.86	1555.78±15.16	1966.14±40.01
			ED	E	DE	CD	CD
	11	14	327.13±9.82	523.02±17.30	1023.46±26.32	1539.92±34.32	2037.17±38.12
Stocking density (Rabbits/cage):							
					A	A	A
	4		-	(N = 464)	114.66±12.29	1635.15±14.12	2044.83±16.31
					B	B	B
	7		-	(N = 343)	1048.87±00.39	1565.98±11.47	1992.13±13.73

Means within the same column, in each category, with different superscripts are significantly different from each other.

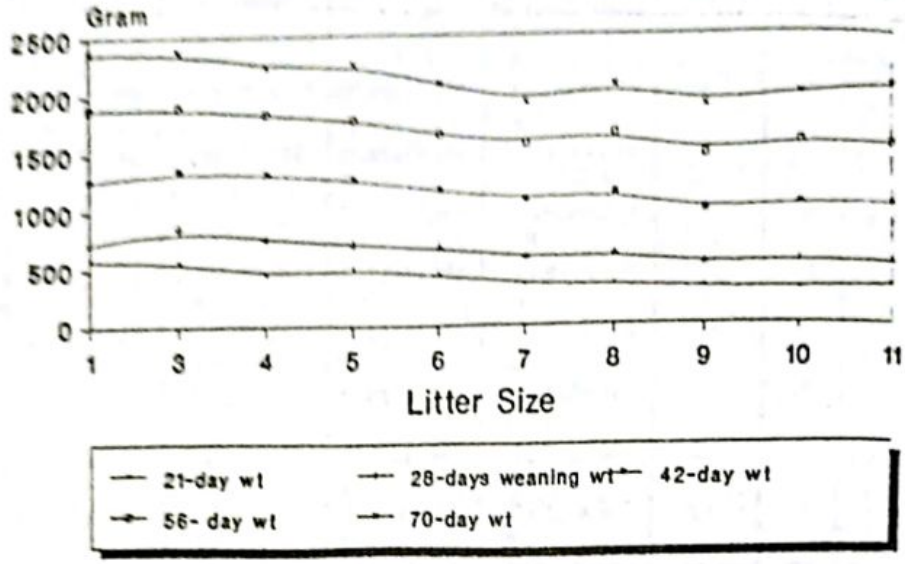

Fig. (1): Body weights at preweaning (21- day), weaning (28-day) and postweaning periods (42, 56, 70 days) in rabbits.

numbers of the kits at kindling. The largest average body weight was found with litter size one and three kits (572.00 and 565.11 g, respectively) the difference between them is non significant (P <0 .05).

Litter size of 3 kits were found to have higher and significant (P < 0.01) body weights at 21, 28, 42, 56 and 70 days of age. This may be due to smaller number of kits per doe, the better chance to use the mother's teats, with the absence of the hard competition among kits to have some milk specially during pre-weaning period. These findings agreed with those reported by Zsolt et al. (1989).

Litter size of one to six kits/doe had no significant effect on body weights at 42, 56 and 70 day of age. This Might be due to the independence of youngsters from their dams and had the free choice for their rations provided.

Also, 4 and 6,7 and 8, 8 and 9 and 9 ,10 and 11 kits/doe, did not differ significantly from each other at 21 days of age in their body weights.

At 28 days of age, 4-6 as well as 7-11 kits/doe had no significant difference between body weights during these ranges, respectively.

After weaning at 42, 56 and 70 days of age, these were no significant (P < 0.05) difference between body weights of litter sizes of 7-11 kits/doe, and this may be due to the effect of proper feeding management according to the number.

As shown previously from table 1, the significant effect of stocking density on body weights. Low stocking density (4/cage) had high significant higher body weights at 42, 56 and 70 days of age

than high stocking density (7/cage) Table 1. The weights at 42, 56 and 70 days of age were respectively 1141.66, 16.35.15 and 2044.03 versus 1040.87, 1565.98 and 1992.13 at 4 and 7 rabbits/cage respectively.

These results indicated the best growth rate of rabbits when they had enough space in the cage, and less stress effects of crowdness which may lead to body weight declining. Similar suggestions were reported by Maertens and De Groot (1984), and Hmilton and Lukefahr (1993).

Table (3): Regression coefficients and their standard errors (b+SE) as well as coefficients of determination (R^2 %) of body weights at different age phases of new Zealand white rabbits on litter size.

Traits	b+SE	R^2 %
Body weight at:		
21-day	-29.95+1.27**	40
28-day	-34.09+2.53**	18
42-day	-39.69+4.25**	9
56-day	-31.24+6.50**	3
70-day	-26.52+8.47**	1

** P < 0.01 (highly significant).

To show the contribution of litter size to the variations in body weights, regression analysis of body weights on litter size are presented in Table 3. Negative regression coefficients, ranged from 26.52 to 39.69 during the period from 21 to 70 days of age indicating that, with the increasing of litter size by one unit, body weights declined by the amounts equals to regression coefficients (b). Meanwhile, the contribution of litter size to the variation in body weights were not the same at different age periods. Pre-weaning weight (21 days) had the huge contribution of the linear function of litter size to the variation in body weights. So that 40% of the variation in this trait can be accounted for by a linear function of litter size, (Gomez and Gomez, 1989). Litter size had less contribution to the variations in body weights at 28 days of age. It shares 18% of the variations. After weaning these contribution declined to, 3 and 1% at 42 ,56 and 70 days of age.

These results may be due to, before weaning the only and major source of feed are the dam's milk, so that body weights of pre-weaning periods depend largely on the litter size which consume the same amount of milk, but after weaning there was no longer dependance on dam's milk, so that litter size had poor contribution to the variations in body weights.

In conclusion, litter size is a good predictor to 21 and 28 day pre-weaning weights but it did not after this period, and the breeder might use fostering principles to have kits from larger litter sizes to smaller ones up to 6 kits/doe, and after weaning the suitable density is 4 rabbits per cage 75 x 75 x 45Cm.

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